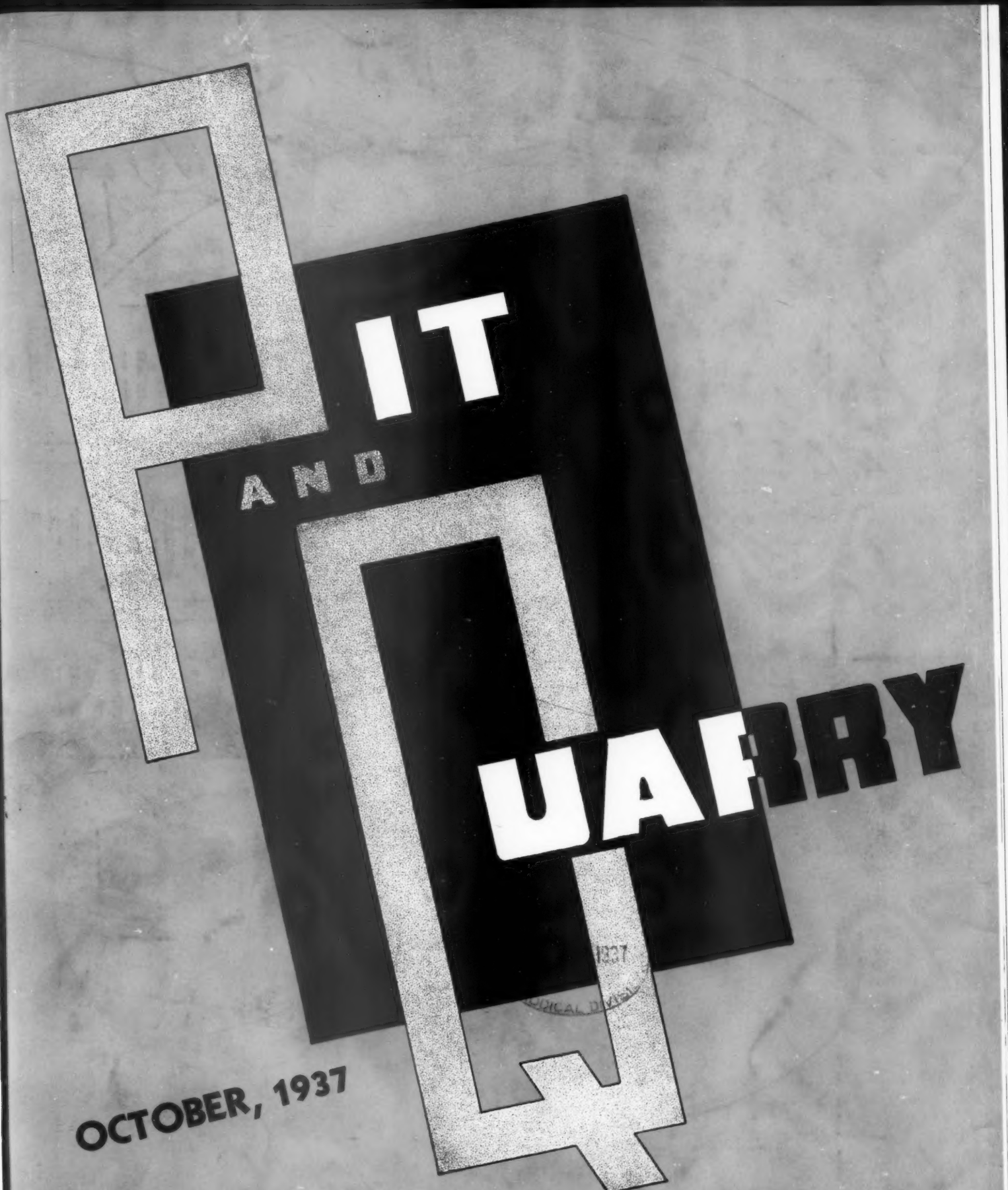


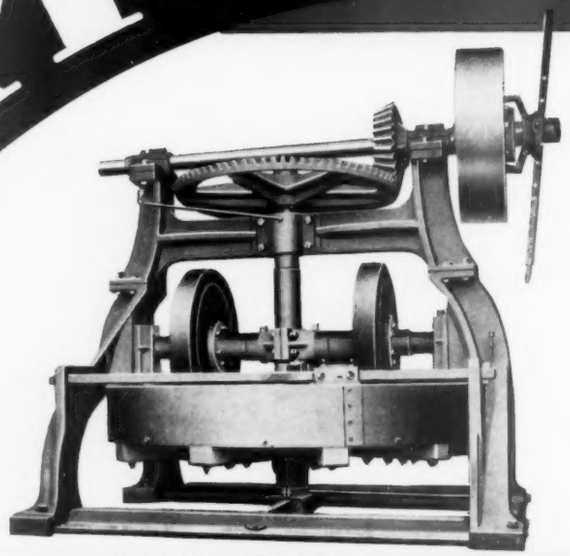
1937
TECHNICAL DIVISION

OCTOBER, 1937

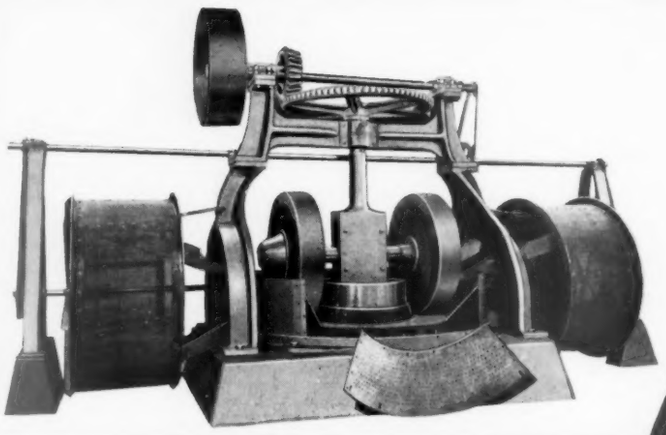
Universal-Atlas' Rebuilding Program . . . Largest Lime Putty Operation . . . A New Attack on the Silicosis Menace . . . Floating Gravel Plant in Illinois . . . Grading Specifications for Sand

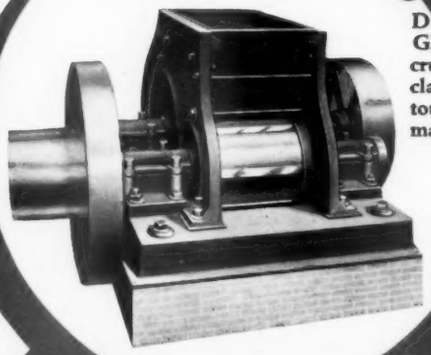
NT IN BINDING

PATTERSON

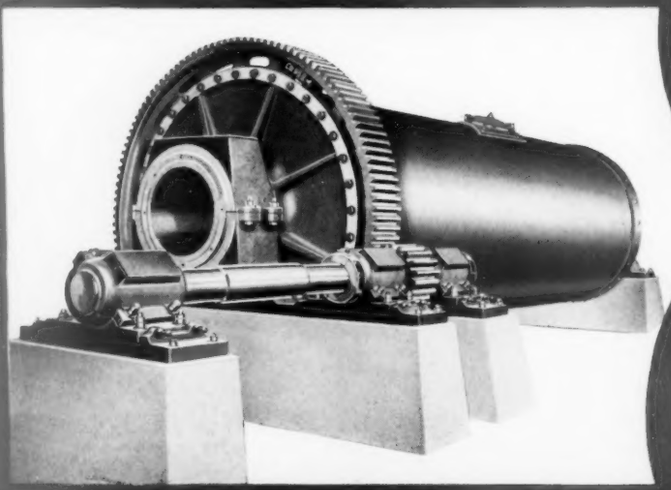


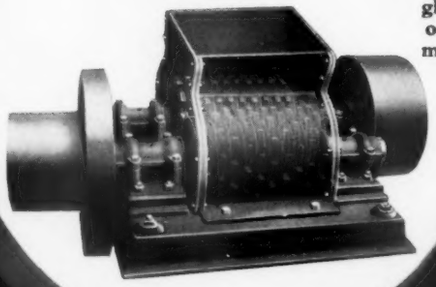
CRUSHING & GRINDING MACHINES





DISINTEGRATORS for crushing wet clay and other tough, moist materials.





TYPE "B" CRUSHER for crushing agglomerates and other friable materials.

THE PATTERSON FOUNDRY & MACHINE CO.

Richard L. Cawood
President

EAST LIVERPOOL, OHIO, U. S. A.

Saves $1,000.00 a Year!

Recovers Fine Sand Formerly Lost in Overflow Water

● J. E. Montgomery, sand and gravel contractor of Mt. Dennis, Ont., speaking:

"Our 15′ dia. Rotoscoop receives wet sand from the vibrating screen and does a very efficient job of recovering the available sand grains of sufficient fineness to meet specifications. The sand is discharged direct to an inclined belt conveyor, which in turn discharges it to a stock pile, dry enough for immediate delivery by truck.

"On the basis of our several years' experience with the dewatering wash boxes, we are actually saving $1,000 per year in maintenance by using the Rotoscoop. It is efficiently producing a satisfactory product in the most economical way."

● The Rotoscoop can be fitted in to take the overflow from present sand units or to replace them. It is made in four sizes: 6, 9, 12 and 15′ dias., with capacities ranging from 20 to 150 T. P. H., based on material weighing 100 lbs. per cu. ft. Send for Folder No. 1463.

Link-Belt Company, Chicago, Philadelphia, Indianapolis, San Francisco, Atlanta, or Toronto. 7175

BELOW: General view of J. E. Montgomery Sand & Gravel Plant. Employs Link-Belt Anti-Friction Belt Conveyors and 15′ dia. Dewatering Rotoscoop (upper illustration) for reclaiming and dewatering the sand grains in the overflow water. Foreground shows 25,000 cu. yd. pile of sand recovered by the Rotoscoop.

LINK-BELT

Equipment for Handling Sand, Gravel, Stone

PIT AND QUARRY, October, 1937. Vol. 30, No. 4. Published monthly by the Complete Service Publishing Company, 538 South Clark Street, Chicago, Ill. Subscription price $1 for 1 year in the U. S. and possessions, Canada and Central and South America; elsewhere $1 additional for each year. Single copies 20 cents. Entered as second-class matter November 28, 1932, at the Post-Office at Chicago, Ill., under the Act of March 3, 1897. Additional entry at Milwaukee, Wis.

THE FINEST ROCK BIT—

MONEY CAN BUY

You couldn't buy a better removable rock bit than the TIMKEN Rock Bit—no matter how much you might be willing to pay for it.

The TIMKEN Bit is a quality tool through and through—from the unique shoulder construction which increases drilling speed, protects the threads and assures easy removability to the special deep-hardened TIMKEN Steel which prolongs bit life far beyond that of ordinary bits.

As might be expected TIMKEN Bits cost more, but when you consider how much faster they drill and how much longer they last you will realize that they are the most economical in the end.

There is a Timken Authorized Distributor and Timken Authorized Conversion Shop (for converting steel for use with TIMKEN Bits) within range of your telephone. Write for the address.

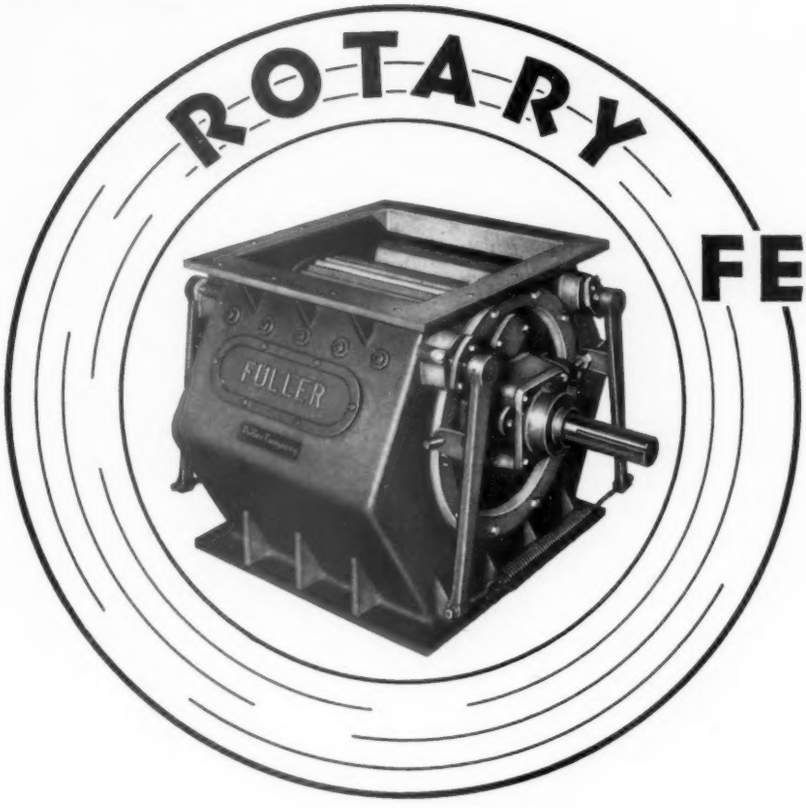
HIAWATHA, Timken Bearing Equipped streamlined flyer of the Milwaukee Road

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

Manufacturers of Timken Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; Timken Alloy Steels and Carbon and Alloy Seamless Tubing; Timken Rock Bits; and Timken Fuel Injection Equipment.

TIMKEN ROCK BITS

FULLER



FEEDERS

for
pulverized
fine, crushed,
or granular
materials

Prove their efficiency

"Action speaks louder than words" Likewise orders, installations, and satisfied operators tell a story more convincing than numerous arguments we might put forth in this advertisement.

During the past few months Fuller Rotary Feeders have been installed in many cement plants throughout the country. Result -- only the highest words of praise for the satisfactory performance and savings secured from their reliability in continuous service under the most adverse installation conditions.

A few recent installations

No. 1

16 Feeders — Raw material kiln feed
9 Feeders — Pack-house circulation control
6 Feeders — Raw material blending

No. 2

12 Feeders — Raw material kiln feed

No. 3

11 Feeders — Tube mill feed
4 Feeders — Raw material blending

No. 4

8 Feeders — Raw material blending

We welcome the opportunity to confer with you on any problem you may have regarding feeding of pulverized, fine, crushed, or granular materials.

FULLER COMPANY
CATASAUQUA, PENNSYLVANIA

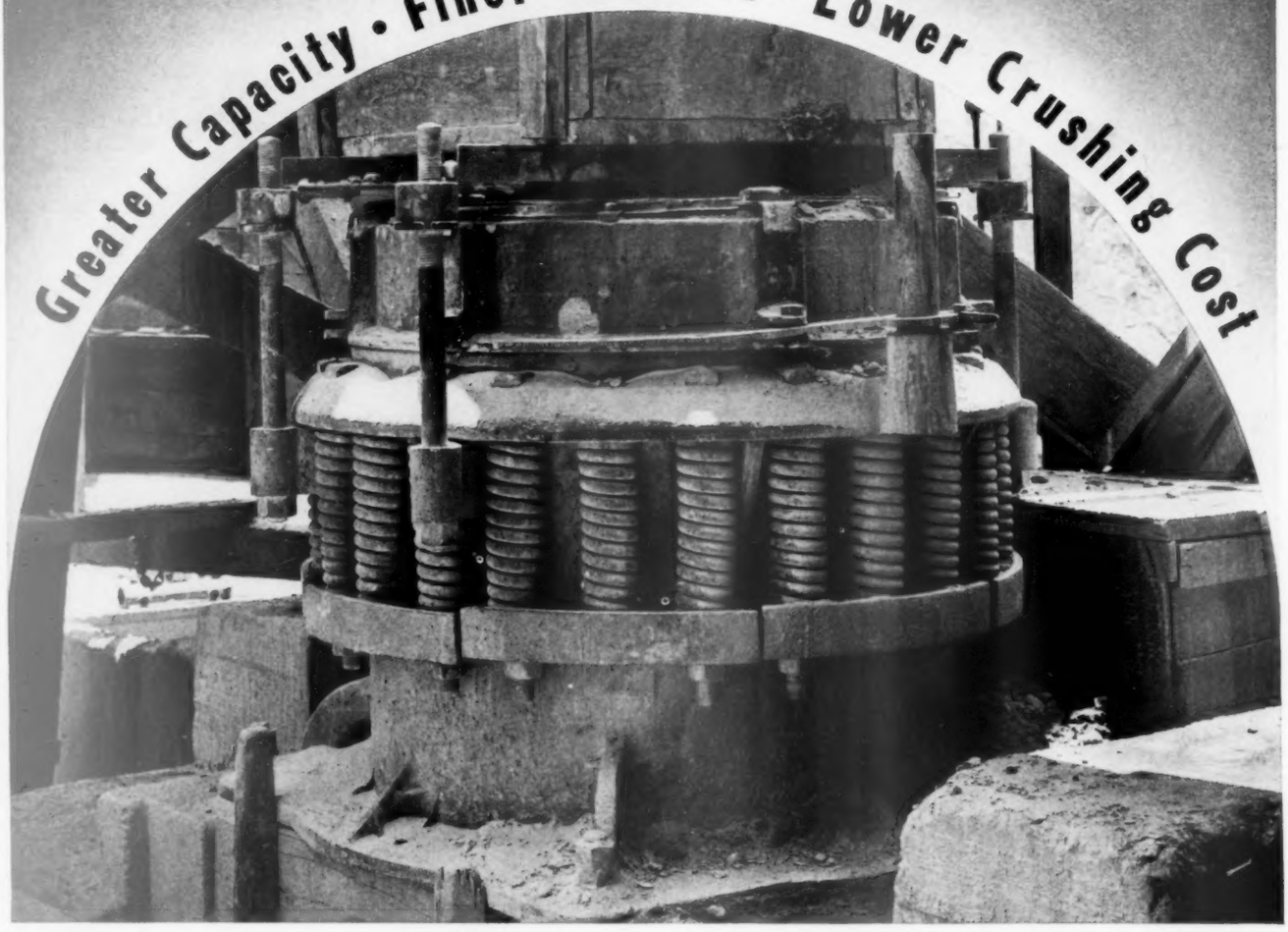
Chicago: 1118 Marquette Bldg.
San Francisco: 320-321 Chancery Bldg.

F-3

FULLER-KINYON, FLUXO, AND AIRVEYOR CONVEYING SYSTEMS · · · · ROTARY FEEDERS AND DISCHARGE GATES
ROTARY AIR COMPRESSORS AND VACUUM PUMPS · · · AUTOMATIC BATCH WEIGHERS · · · BIN SIGNALS

first Among Reduction Crushers

Greater Capacity • Finer Product • Lower Crushing Cost



The predominance of Symons Cones

among plants producing finely crushed materials in quantity, definitely stamps them first in the reduction crusher field. Because of a unique process of crushing, Symons Cones make possible a greater capacity of fine product and at a substantial reduction in crushing cost.

Meet today's demands for finer crushed and better materials with Symons Cones. They will help toward more profitable operation also. There is a size for plants large and small and a type that makes just the kind of product desired. Join with the many who have installed Symons Cones and have solved their reduction crushing problems.

NORDBERG MFG. CO. MILWAUKEE WISCONSIN

New York City 60 E. 42nd St. | Los Angeles Subway Terminal Bldg. | Toronto Concourse Bldg. | Mexico City Edificio Cook | London Bush House

SYMONS CONE CRUSHERS

HOW THE G.T.M. TAMED the belt-breaking fuller mill drives

TROUBLE WAS THE FIRST, last and middle name of these two fuller mill *drives* in a large eastern chemical works.

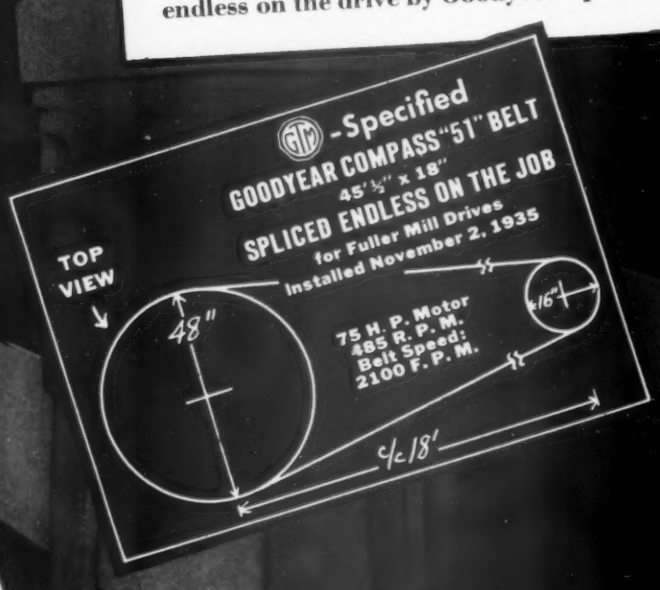
FASTENERS PULLED OUT on an average of once a month under the shock loads and stretch had to be cut out at frequent intervals. Constant fraying by riding up against the motor frame was another difficulty, while a severe abrasive dust condition made large and regular applications of dressing necessary to keep the drives functioning.

ONE YEAR'S SERVICE was the maximum being obtained from the highest quality ply belts, six months the average and that only with considerable nursing, when the plant superintendent told his troubles to the G.T.M.—Goodyear Technical Man.

ON THE G.T.M.'S RECOMMENDATION a Goodyear COMPASS "51" Belt was applied on No. 1 mill on November 2, 1935 and on No. 2 mill on February 16, 1936. To end the fastener difficulty both belts were made endless on the drive by Goodyear's patented vulcanized splice. To overcome the dust both belts were made with an inner ply of Goodyear's new 3-R friction surface whose permanent high adhesion makes it possible to operate heaviest drives at 25% to 50% lower tension.

TODAY, ALMOST TWO YEARS LATER, both belts are performing faultlessly and have never required a single repair. COMPASS' balanced true-running construction has eliminated riding up on the pulleys. In all this time no dressing has been necessary except *one* application of a special Goodyear-prepared compound to the surface of No. 1 belt after its first year's service. *The plant estimates that the saving in dressing cost alone has paid for the belts—while the saving in repairs is all gravy.*

THIS IS THE KIND of money-saving belt performance the G.T.M. stands ready to furnish on your hardest drives. To bring him to your office, write Goodyear, Akron, Ohio, or Los Angeles, California—or the nearest Goodyear Mechanical Rubber Goods Distributor.

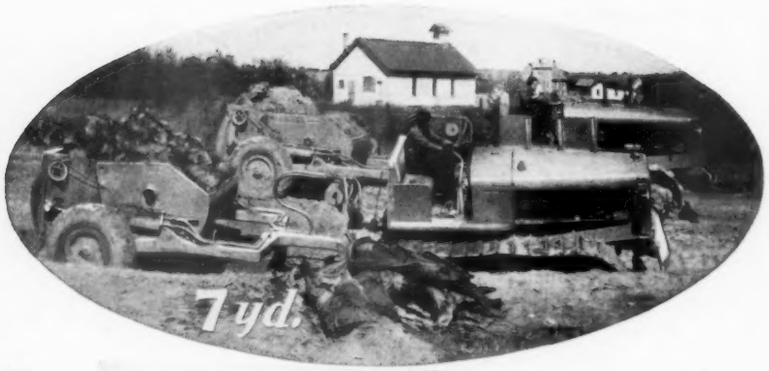


BELTS
MOLDED GOODS
HOSE
PACKING
Made by the makers of Goodyear Tires

THERE'S A GOODYEAR BATTERY NOW!

THE GREATEST NAME IN RUBBER
GOODYEAR

Choose from the Complete Continental Line!



You don't have to buy a 5-yard Wagon Scraper to do a 4-yard job, nor a 5-yard scraper to do the work of a 10-yard capacity unit. Continental builds a complete line of Wagon Scrapers: 4, 5, 7 and 10 yard sizes, each suited to the available tractor power — four sizes mounted on rubber-tired wheels, and the three larger sizes mounted on crawler tracks.

Continental Wagon Scrapers are ideal for all sand and gravel stripping operations; and no bulldozing is needed in wasting overburden with Continental Wagon Scrapers for they back-dump like a truck and can be used to make fills in close quarters, over banks or into water.

Every model in the entire Continental Line features: faster loading, hauling and dumping; less tractor power required; and complete positive hydraulic control of all operations.

Continental Wagon Scrapers are lighter in weight per yard of capacity, yet stronger and more ruggedly constructed. They back-dump free of the scraper body — *not in the way of it* — and can be readily backed and turned for dumping in "tight places." They'll dig and load anything the tractor can pull through — gummy soil, rocks, tree roots, or other imbedded obstructions.

8 other Continental features:

1. Lightest in weight, yet strongest!
2. Simplest in design and all working actions!
3. Require less tractor power!
4. Backfill entirely over a bank!
5. Dump in close quarters!
6. Turn short and back easily!
7. Load, dump and haul faster!
8. Used for spreading and grading, too!

CONTINENTAL ROLL & STEEL FOUNDRY COMPANY
Tractor Equipment Division
14400 Railroad Avenue
East Chicago, Indiana

SUPERIOR ROAD MAKING MACHINERY

CONTINENTAL WAGON SCRAPERS

NEW!

A Measured Air

EVERY INCH OF POWER FROM EVERY FOOT OF AIR

Thor

Brings

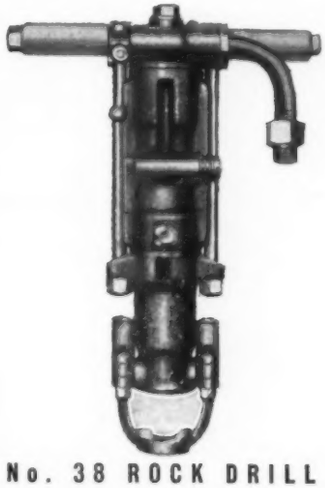
NEW OPERATING ECONOMY TO THOR ROCK DRILLS

LOWER AIR CONSUMPTION
TRUE ECONOMY . . . Put a Flow-Meter in the air line and watch air consumption drop when a Thor drill goes on the job!
FASTER DRILLING SPEED
30-SECOND PROOF . . . Make a Stop-Watch Test of any drills under your own drilling conditions . . . and watch Thor out-drill them all!
MORE POWERFUL ROTATION
NO "STUCK" STEELS . . . "Measured Air" brings EXTRA power for positive rotation. Thor drills keep going in the most difficult formations.
GREATER BLOWING POWER
DIRECT PRESSURE . . . Thor design directs blowing power by the simplest method . . . wastes no air . . . blows the hole clean and the cuttings clear.

Thor's exclusive new principle of "Measured Air" is being recognized as one of the outstanding developments in rock drill construction in years. The Thor valve, with its extremely short travel (1/32"), cuts in and out quicker than any other valve now in use, and admits a controlled and "measured" quantity of air in back of the piston hammer. Because the quantity of air admitted is so precisely governed, the piston hammer functions perfectly on every stroke. Performance is uniform. There is no power wasted. Drilling efficiency is increased.

In addition, because of the rapid valve action, the valve cuts off early, allowing the air to expand in the cylinder. Thus, Thor Rock Drills with *"Measured Air"* utilize effectively all the air that enters the machines.

"Measured Air" brings to Thor Rock Drills, supremacy in all FOUR-FEATURES pictured at the left. Test these Four-Features on your own work and see why Thor Rock Drills bring super-duty performance with amazing air economy. A Thor Representative will gladly arrange a trial so that you may have PROOF of performance.



No. 38 ROCK DRILL

GET THE STORY OF 'MEASURED AIR'

Write to the nearest Thor branch for your copy of "What is 'Measured Air'?".

TOOL MAKERS Thor SINCE 1893

INDEPENDENT PNEUMATIC TOOL CO.
600 WEST JACKSON BLVD., CHICAGO, ILLINOIS
COCHISE ROCK DRILL MFG. CO. (Division) 6200 E. SLAUSON AVE., LOS ANGELES, CAL.

Birmingham, Ala. Detroit, Mich. Philadelphia, Pa. Toronto, Ont. Boston, Mass. London, England Pittsburgh, Pa.
Buffalo, N. Y. Milwaukee, Wis. St. Louis, Mo. Cleveland, Ohio New York, N. Y. San Francisco, Cal.

BUCYRUS-MONIGHAN

can safely work close to the edge of a bank. It rests on its circular base when digging . . . not on its extending traction treads . . . ready to step away at an instant's notice. The ground bearing pressure is lower than that of any other dragline. Manufactured by Bucyrus-Monighan, Chicago, Illinois.

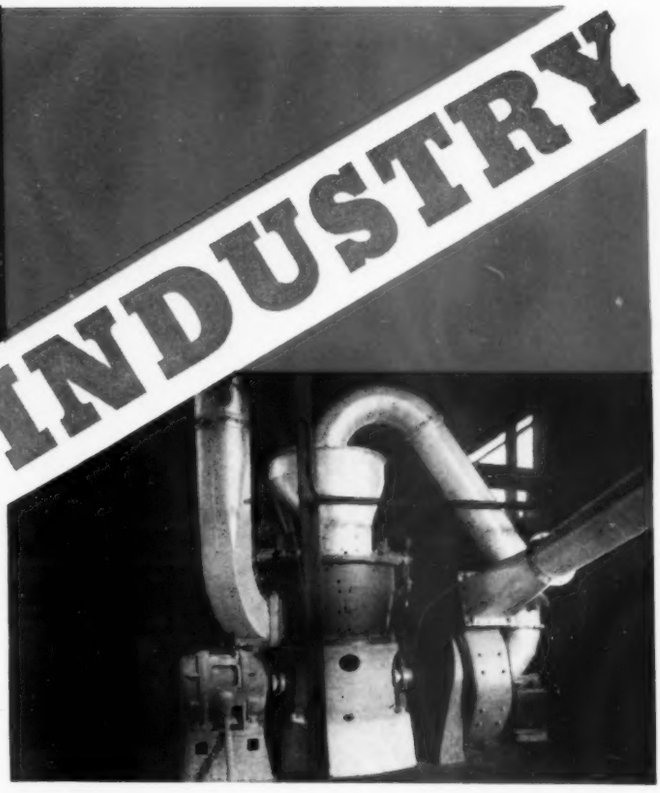
Illustrated: Gravel pit operations on one of Winston Brothers Company jobs in Idaho.

BUCYRUS MONIGHAN

Sold by BUCYRUS-ERIE CO.
SOUTH MILWAUKEE, WISCONSIN, U.S.A.

1056

Raymond Bowl Mill installations operating in nationally known cement plants for direct firing rotary kilns.

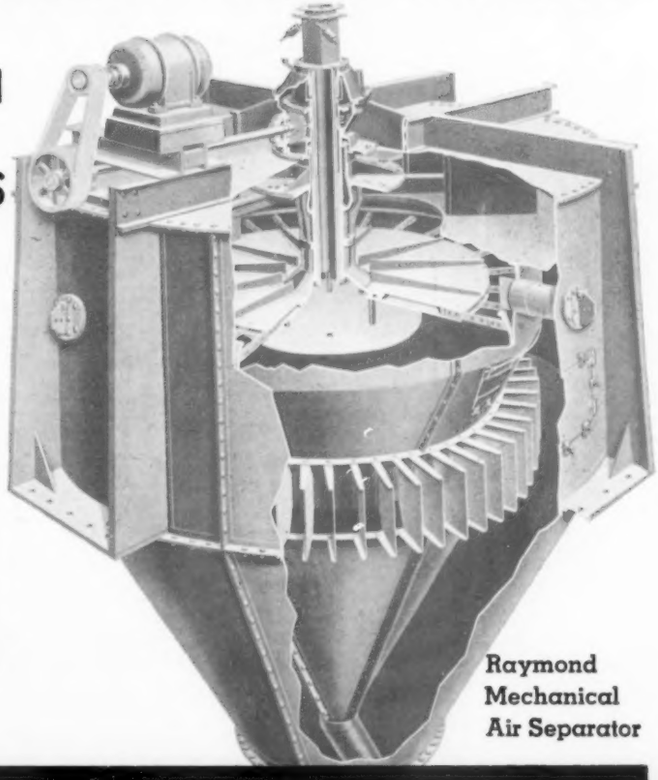


CEMENT INDUSTRY "going places" WITH RAYMOND EQUIPMENT

TEN . . . . .
BOWL MILLS and
EIGHT . . .
WHIZZER SEPARATORS

These 18 Raymond units are being operated by one prominent concern alone . . . installed in five different plants. The Bowl Mills are direct-firing rotary kilns at the lowest fuel and operating costs ever obtained by the company. The Raymond Mechanical Air Separators are handling both raw mix and finished cement at record capacities, due to the patented whizzer feature that accelerates separation by culling out the oversize and delivering a maximum of uniform fines . . . a superior method of making high early strength cement. All subsequent units were bought on the performance of the original Raymond installation. Producers who "investigate before they invest" are specifying Raymond equipment because of its known economy in cement production.

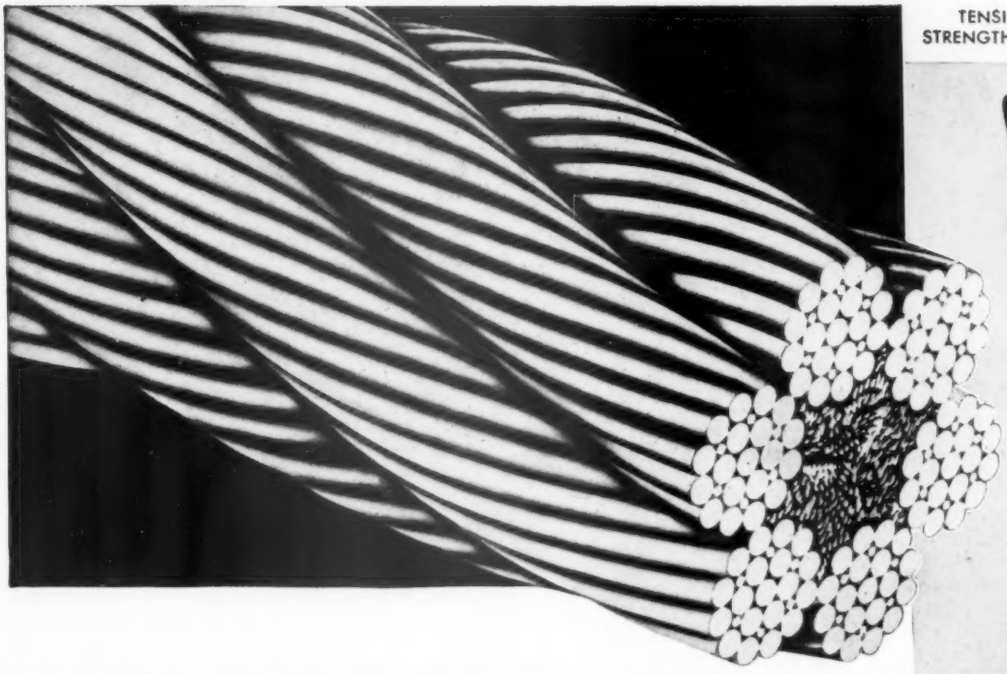
Write for bulletins.



Raymond Mechanical Air Separator

RAYMOND PULVERIZER DIVISION
COMBUSTION ENGINEERING COMPANY, INC.
1321 North Branch Street **CHICAGO**
Sales Offices in Principal Cities • • • In Canada: Combustion Engineering Corporation, Ltd., Montreal

THE RIGHT SCREEN FOR EVERY JOB
WHATEVER your screening problem, Allis-Chalmers has the answer. The four vibrating screens listed below are built in a wide variety of sizes, single or multiple decks, standard or dust tight.
* Aero-Vibe... most economical where tonnages are not too heavy. (Illustrated)
* Style B Centrifugal ... positive eccentric type for the heaviest loads and large tonnages.
* Low Head ... a horizontal type for locations with little headroom.
* Utah Electro-Magnetic ... a new type of double acting electric screen with built-in rectifier...used mostly for fine screening.
Write or call Allis-Chalmers on any crushing, washing, screening, or grinding problem.
825
10
EQUIPMENT ENGINEERS TO INDUSTRY
ALLIS·CHALMERS
MILWAUKEE WISCONSIN



WE TESTED THIS 450 TIMES

To prove its Quality

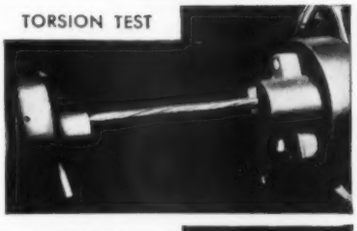
JUST as each part of a well built machine* must be tested individually before it is accepted, so each individual wire in American Tiger Brand Wire Rope is tested at least 3 times, in addition to test for size, before it can pass to the stranding machines.

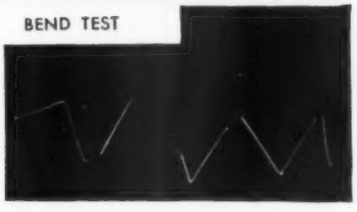
Your work puts wire rope to the severest tests. It must string or reeve easily and quickly . . . spool well . . . avoid whipping at high speeds . . . take the terrific jerks of starting and stopping.

And it is these qualities in American Tiger Brand Wire Rope which have given it a dominant position in the field—qualities which have been built into it by engineers whose wealth of experience is backed by over 100 years of wire making.

American Tiger Brand Wire Rope is available in either Standard (non-preformed) or Excellay (preformed) constructions.

***USS American Tiger Brand Wire Rope is a machine, more depended on than many. It fits the definition "Any combination of mechanism for utilizing or applying power."**





AMERICAN TIGER BRAND WIRE ROPE

American Tiger Brand Wire Rope. Electrical Wires & Cables. Amerclad All-Rubber Cables. Aerial Tramways. Tiger Wire Rope Slings. Tiger Wire Rope Clips.

AMERICAN STEEL & WIRE COMPANY
Cleveland, Chicago and New York

COLUMBIA STEEL COMPANY
Russ Building, San Francisco

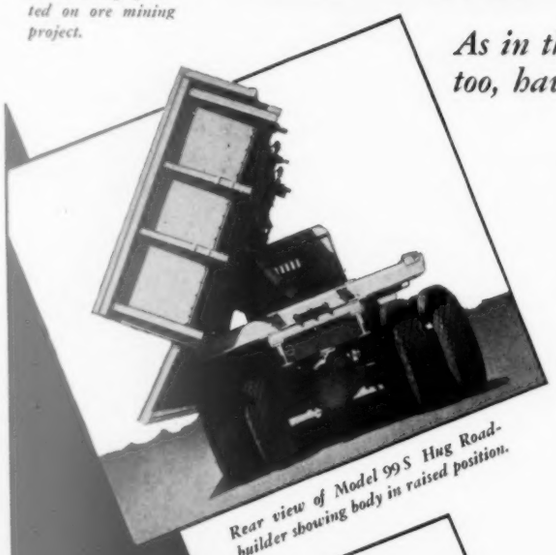
United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

HUGS are built to do a particular job Well!

Model 99 S Hug Roadbuilder delivered to Butler Bros. St. Paul, Minnesota. equipped with two-way side dump body. Truck being operated on ore mining project.

As in the case of Butler Bros. of St. Paul, Minnesota, you, too, have a particular hauling job that must be done well.



Rear view of Model 99 S Hug Roadbuilder showing body in raised position.

Side view of Model 99 S Hug Roadbuilder showing body in raised position.

Hugs are built to fit your specific hauling problem regardless of conditions. Their electric arc welded "I" beam frames, powerful gas or Diesel truck engines with a wide range of transmission speeds, double reduction rear axle and the many other sturdy features of design in the Hug body and chassis assures you a transportation unit that will haul and keep hauling payload after payload at consistently lower hauling costs.

Hug Roadbuilder trucks are adaptable for all types of dump truck service and can be furnished with dump body equipment to meet your requirements in either rear end dump or side dump bodies. Hug bodies are built as integral units with the Hug chassis, thereby assuring proper load distribution and design.

Let Hug engineers analyze your hauling problems and furnish you with the proper transportation unit for your requirements.

HUG

The **HUG** COMPANY
704 CYPRESS ST.
HIGHLAND, ILLINOIS

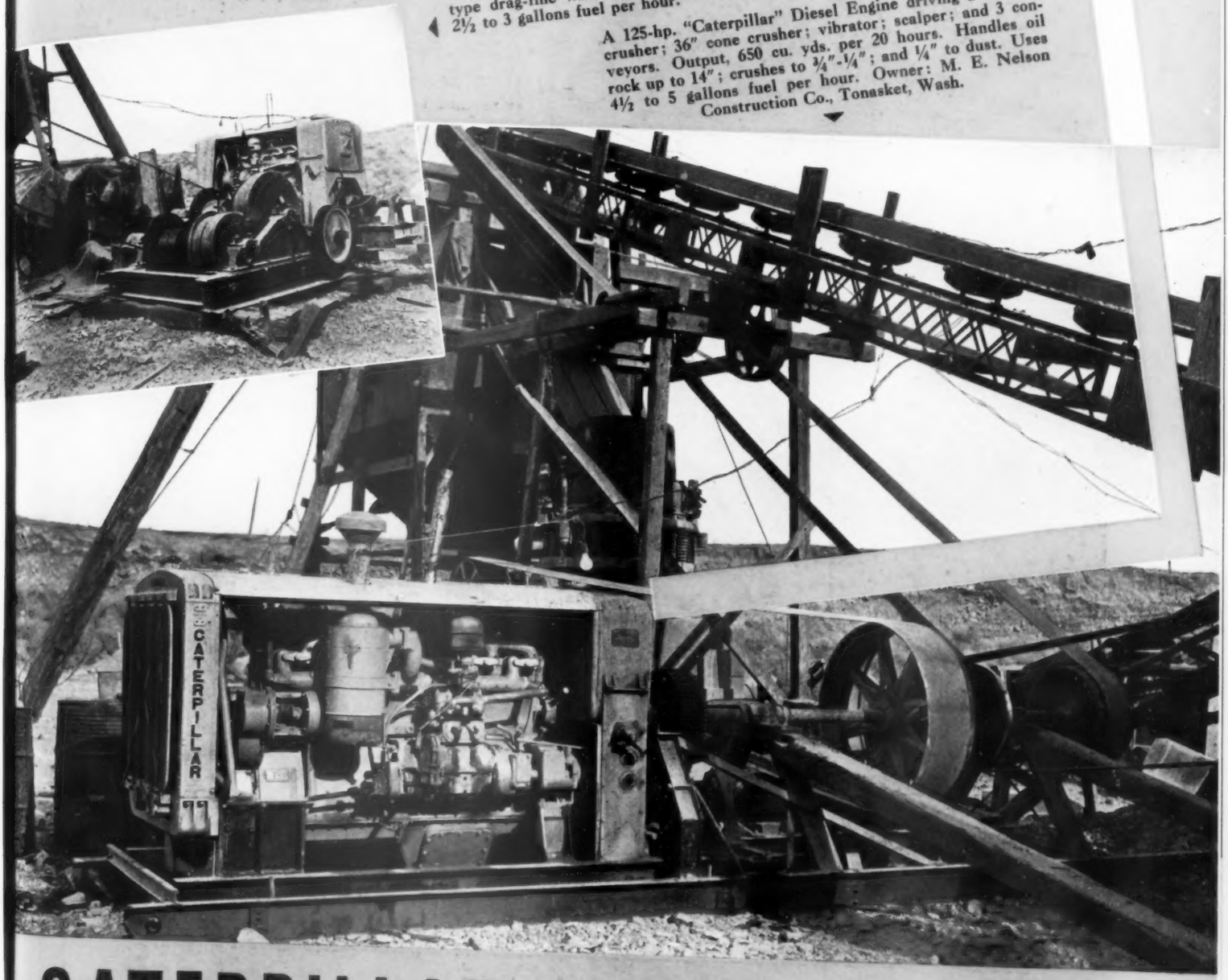
HARD ROCK—SOFT PICKINGS

WITH "CATERPILLAR" DIESELS

IT TAKES a mighty "mouthful" to make a "Caterpillar" Diesel quit. Its punch-and-persistence keeps crusher jaws crunching no matter how tough the "food." • And yet "Caterpillar" Diesels are gentle with pocketbooks. Take the plant pictured here, for instance: Its two "Caterpillar" Diesel Engines, combining 205 hp., breeze along twenty hours a day on 7 to 8 gallons of 7½-cent fuel per hour. (Or less than 2c per cubic yard of material delivered.) "Dirt cheap!" say rock and quarry men who know how Diesel compares with other types of power. • Besides operating at a low cost that really means something, "Caterpillar" Diesel Engines are hanging up records for dependability and continuous repairless operation that make maintenance costs unimportant. A "Caterpillar" dealer can bring you startling facts-and-figures on power costs. Or, write us direct.

Same plant as below. An 80-hp. "Caterpillar" Diesel Engine operating cable-type drag-line with 1½-yd. scraper. Supplies rock for crusher. Consumes 2½ to 3 gallons fuel per hour.

A 125-hp. "Caterpillar" Diesel Engine driving a 15"x36" crusher; 36" cone crusher; vibrator; scalper; and 3 conveyors. Output, 650 cu. yds. per 20 hours. Handles oil rock up to 14"; crushes to ¾"-¼"; and ¼" to dust. Uses 4½ to 5 gallons fuel per hour. Owner: M. E. Nelson Construction Co., Tonasket, Wash.

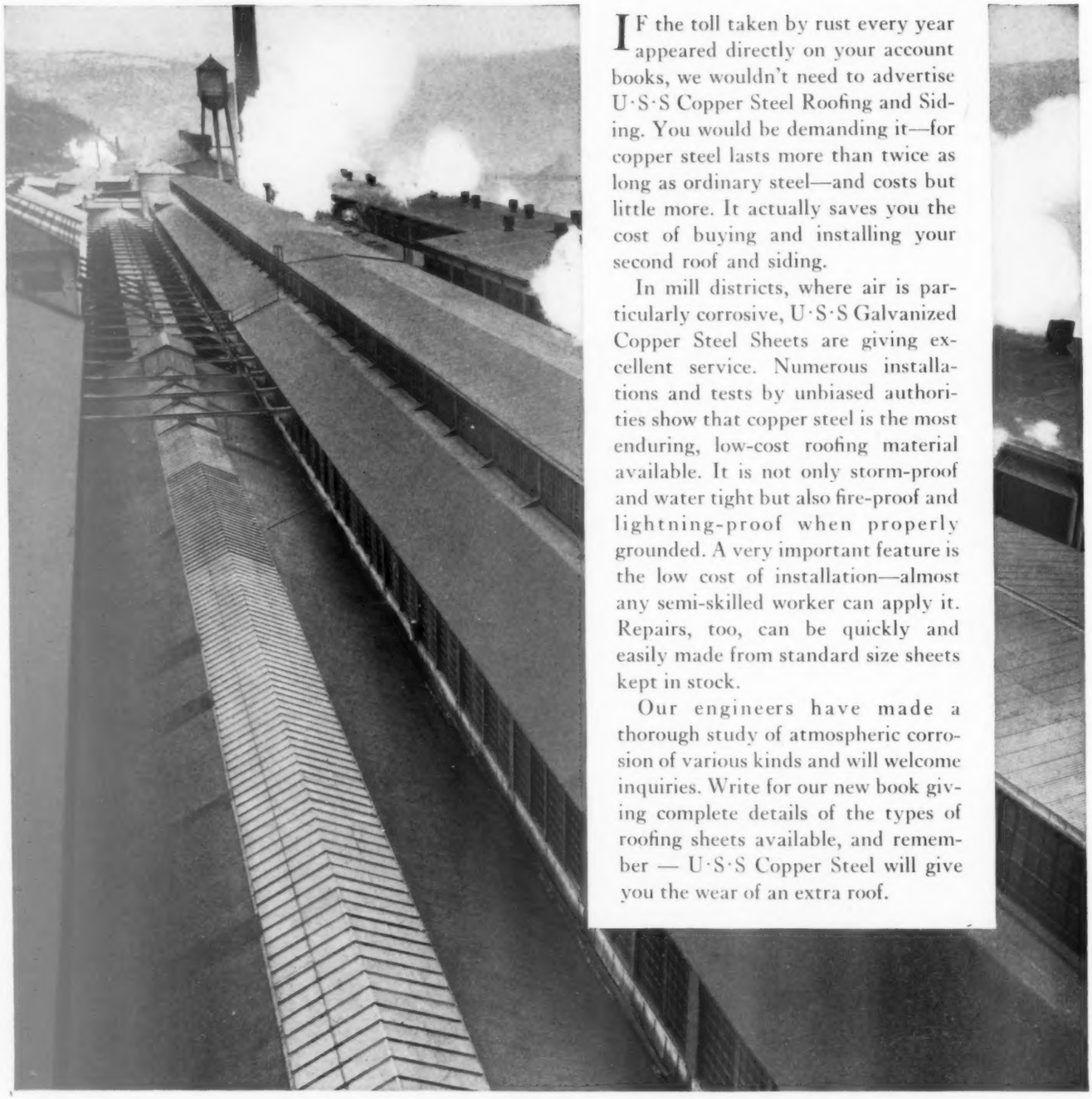


CATERPILLAR DIESEL ENGINES

REG. U.S. PAT. OFF.

CATERPILLAR TRACTOR CO., PEORIA, ILL. . . . WORLD'S LARGEST MANUFACTURER OF DIESEL ENGINES

SAVE *the cost of a Second Roof . . . by using* **COPPER STEEL**



IF the toll taken by rust every year appeared directly on your account books, we wouldn't need to advertise U·S·S Copper Steel Roofing and Siding. You would be demanding it—for copper steel lasts more than twice as long as ordinary steel—and costs but little more. It actually saves you the cost of buying and installing your second roof and siding.

In mill districts, where air is particularly corrosive, U·S·S Galvanized Copper Steel Sheets are giving excellent service. Numerous installations and tests by unbiased authorities show that copper steel is the most enduring, low-cost roofing material available. It is not only storm-proof and water tight but also fire-proof and lightning-proof when properly grounded. A very important feature is the low cost of installation—almost any semi-skilled worker can apply it. Repairs, too, can be quickly and easily made from standard size sheets kept in stock.

Our engineers have made a thorough study of atmospheric corrosion of various kinds and will welcome inquiries. Write for our new book giving complete details of the types of roofing sheets available, and remember — U·S·S Copper Steel will give you the wear of an extra roof.

U·S·S GALVANIZED COPPER STEEL SHEETS

CARNEGIE-ILLINOIS STEEL CORPORATION, *Pittsburgh and Chicago*
COLUMBIA STEEL COMPANY, *San Francisco*
TENNESSEE COAL, IRON & RAILROAD COMPANY, *Birmingham*
Columbia Steel Company, San Francisco, *Pacific Coast Distributors* • United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

WISSCOLAY PREFORMED

THE PERFECT LANGLAY ROPE

Preforming eliminates the tendency of Langlay Rope to loop and unlay.

Select the Rope that Fits Your Job

In Langlay Wire Rope both the wires and strands are twisted in the same direction. When Langlay is not preformed there is a pronounced tendency of the rope to unlay... or become cranky. Preforming, however, "sets" the rope and eliminates this tendency. Langlay Wire Rope is known for its remarkable ability to give long life under the adverse condition of frequent bending over small sheaves. In non-preformed rope its principal limitation is its tendency to unlay and to loop. With "crankiness" eliminated, Langlay Preformed becomes the most desirable rope to use in many places. Write us and we will gladly tell you where and when you can use it.

• •

WICKWIRE SPENCER STEEL COMPANY, *General Offices:* 41 East 42nd Street, New York. *Sales Offices and Warehouses:* Worcester, New York, Chicago, Buffalo, San Francisco, Los Angeles; *Export Sales Dept.:* New York.

WICKWIRE SPENCER SALES CORPORATION, New York, Chattanooga, Tulsa, Portland, Seattle.

WIRE ROPE *by Wickwire Spencer*

Wickwire Spencer also manufactures all sizes and types of Wire Rope in Wisscolay.

WICKWIRE SPENCER STEEL COMPANY
41 East 42nd St., New York City

Please send me my free copy of your popular, new money saving manual, "Know Your Ropes".

Name_____

Firm_____

Address_____

City_____ State_____ P-Q

All Set for Low-cost Production

with G-E Motors Assuring Continuous Operation

G-E motors driving equipment in the lime plant of H. E. Millard

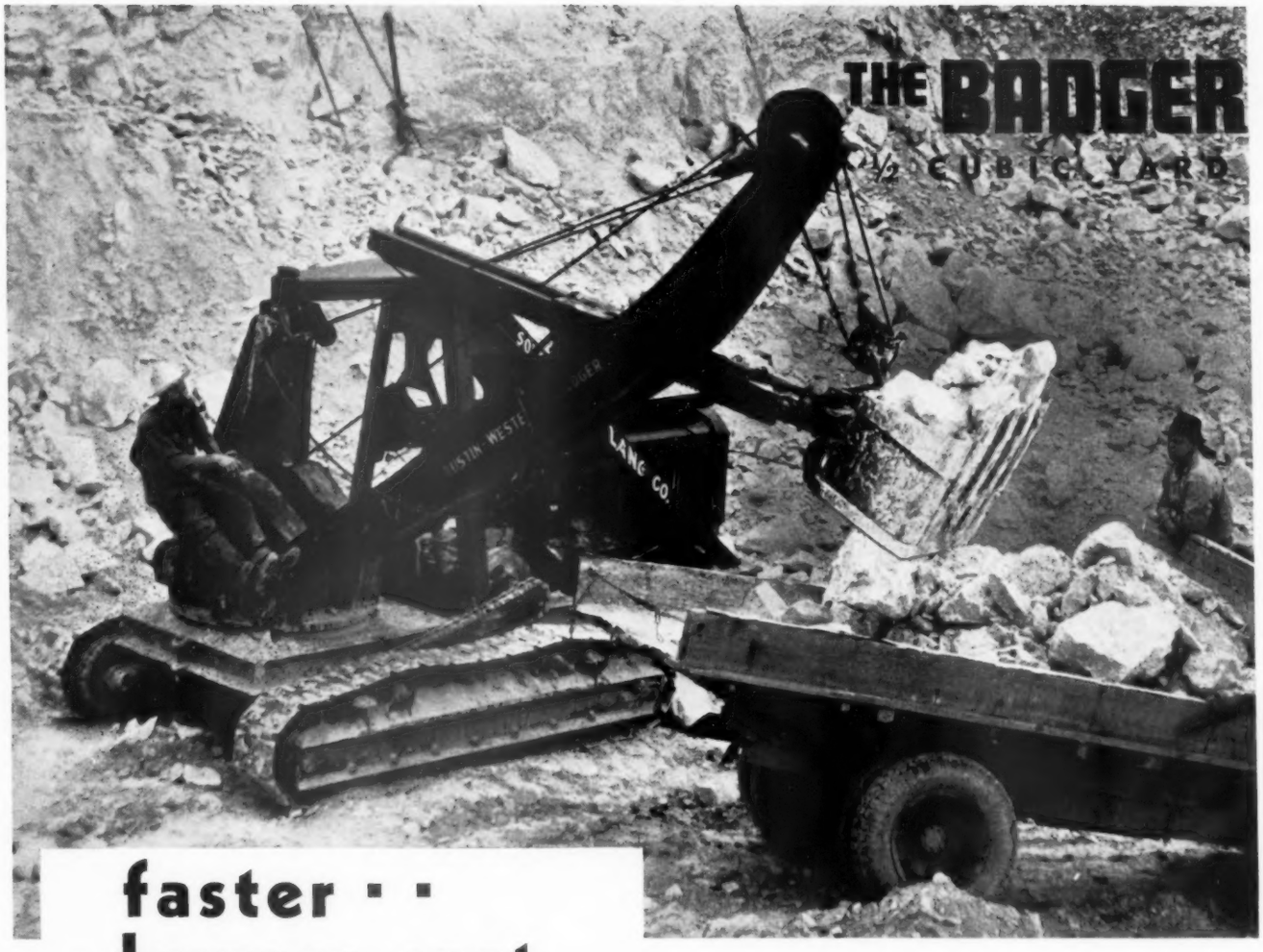
THE new lime plant of H. E. Millard at Annville, Pa., is all set for the low-cost production of high-quality lime. The plant machinery is of the most modern, efficient design, and the G-E motors that drive it help to assure continuous operation.

Most of these motors, operated by G-E matched control, are standard open types. Experience has shown that even where there is dust and vibration, the strong frames and end shields, the unusually protective insulation on the windings, and other features of construction enable G-E standard motors to give dependable, economical service on the toughest kinds of jobs.

You may be considering installing new equipment in your own rock-products plant—such as that illustrated here or of a kind to fit your particular requirements. For complete information about the electric equipment to operate it, call the nearest G-E representative. General Electric, Schenectady, N. Y.

011-255

GENERAL ELECTRIC



faster · ·
· · lowers cost

Whether you are stripping dirt, stock piling, or loading heavy boulders, the Austin-Western Badger is the fastest, most economical ½-yard shovel you can buy.

It's faster: the usual swinging weight of the motor, cab and counterweight are eliminated for faster start, swing, stop, resulting in greater daily output.

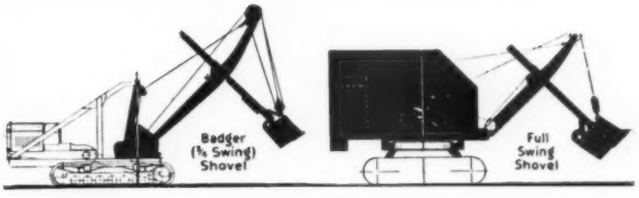
It's cheaper to operate: by eliminating dead swinging weight there is less inertia to overcome in starting and stopping. This permits the use of motors with a smaller horse power resulting in lower fuel and maintenance costs, without loss of speed.

And the Badger digs hard: with a low center of gravity and the whole shovel acting as a counterweight it stands up easily to the ten thousand pound single live pull of the three port line.

Fully roller bearing equipped, easy to transport, easily convertible, the Badger has the strength, speed and endurance that make it outstanding in its class.

Write for construction details and performance records.

THE AUSTIN-WESTERN ROAD MACHINERY CO.
AURORA, ILLINOIS



Compare these 2 diagrams above

In the two diagrams above are shown (in heavy black) the moving parts of the Badger ¾-swing in comparison with Full Swing Shovels. Note the difference.

The Badger has greater speed because it has less inertia and momentum to overcome at the start and stop of the swing. This greater speed together with full half yard dipper capacity makes for outstanding performance in this shovel.

The Austin-Western Road Machinery Co., 1841 Barrows St., Aurora, Ill.
( ) Send a salesman.
Tell me more about:

( ) Shovels & Cranes	( ) 5-Yd. Scraper
( ) Elevating Graders	( ) Rippers & Scarifiers
( ) Blade Graders	
( ) Motor Graders	( ) Crushing & Screening Plants
( ) Road Rollers & Roll-A-Planes	( ) Gravel Washing Plants
( ) Motor Sweepers	( ) Bituminous Distributors
( ) 12-Yd. Scraper	

Name .....
Address .....
City ..... State .....

Austin-Western

Tough Rope for Tough Jobs

"Flex-Set" Preformed Yellow Strand is especially recommended for hoist line, crowd rope, rack rope and swinging lines on power shovels; for dragline and hoist line on dragline machines; for holding line and closing line on clam shell buckets.

Almost any wire rope will serve well enough in some places — but where the going is rough — *and tough*, there "Flex-Set" Preformed Yellow Strand shows its super-quality — its unquestioned ability to *"take it,"* and *"like it."*

This is the same Yellow Strand that has been "taking it" successfully for many years — the same specially drawn wire, tested and selected — the same careful manufacture by the same company that is now *61 years young.*

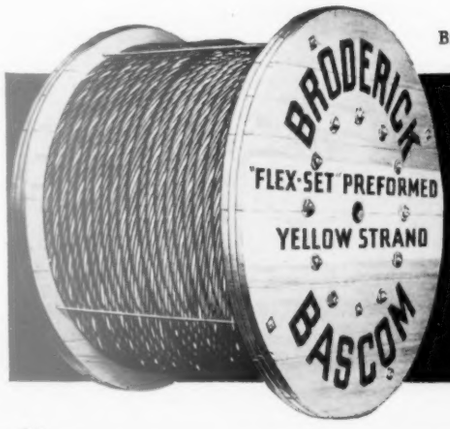
The difference results from preforming, which sets the strands to the helical form they maintain permanently in the finished rope. Thus "Flex-Set" Preformed Yellow Strand is largely pre-broken in. It is limp — easy to handle and install — highly resistant to kinking, fatigue and wear.

With these properties, how could it be other than economical? Try it!

BRODERICK & BASCOM ROPE CO., St. Louis

Branches: New York, Chicago, Seattle, Portland, Houston; Factories: St. Louis, Seattle, Peoria

U-9

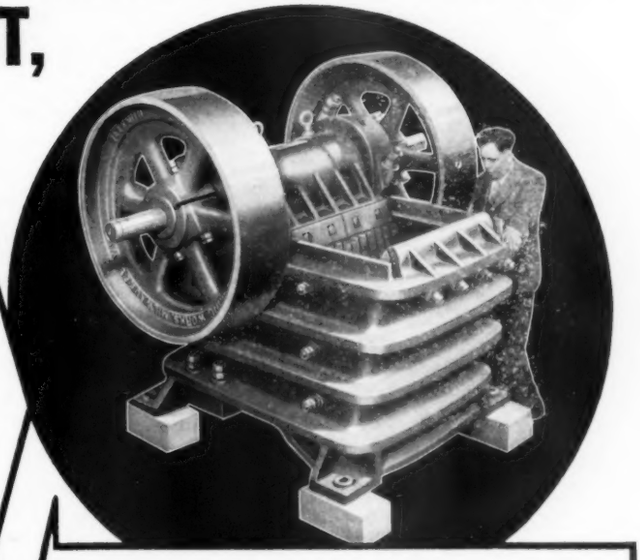


"Flex-Set" Preformed YELLOW STRAND

TELSMITH

LONG LIFE, LOW UP-KEEP EQUIPMENT

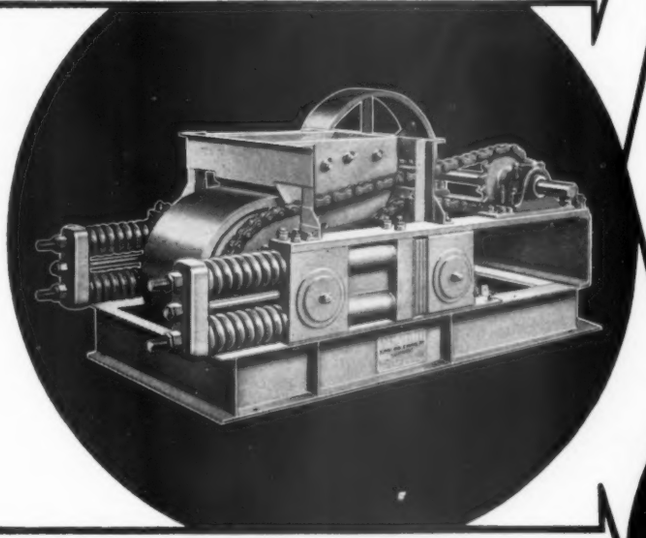
BETTERS THE PRODUCT, LOWERS THE COST



TELSMITH - WHEELING JAW CRUSHER

This super-strong, all-steel force feed jaw crusher gives greater reduction in one process than any other type of breaker. Cylindrical roller bearings and higher speed almost double capacity without any greater expenditure for power. Two toggle settings and simple adjustment allow wide range of product sizing. Made in seven sizes. *Write for Bulletin W-15.*

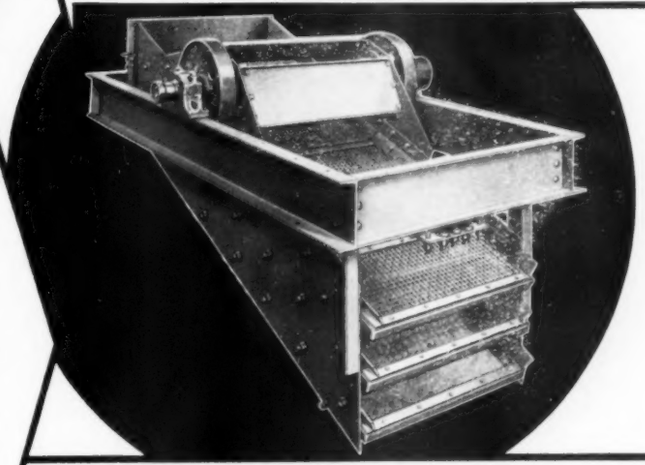
FOR COARSE CRUSHING



TELSMITH DOUBLE ROLL CRUSHER

Telsmith's latest contribution to secondary crushing is this double roll crusher, designed for quantity production of fine aggregate at moderate reduction ratios. The Telsmith Roll Crusher requires little headroom and is economical in first cost. Anti-friction bearings running in oil and spring release insure continuous operation free of break-downs. *Write for Bulletin L-15.*

FOR SECONDARY CRUSHING



TELSMITH PULSATOR

This heavy-duty vibrating screen handles sand, gravel, crushed rock, ore or coal *efficiently*, wet or dry. Maximum screening action, uniform on every inch of wire, on every deck, under any load. Anti-friction bearings and special sealing devices to protect working parts insure long life and low up-keep. Made in eleven sizes in single, double, or triple deck. *Write for Bulletin V-15.*

FOR UNIFORM SCREENING

Associates in Canada: Canadian Ingersoll-Rand Co., Ltd., Montreal, Toronto, Winnipeg, Vancouver

50 Church Street, New York City
201 N. Wells, Chicago, Ill.
1013 Commercial Trust Bldg., Philadelphia, Pa.
81 Binney St., Cambridge, Mass.
412 Westinghouse Bldg., Pittsburgh, Pa.
Brandeis M. & S. Co., Louisville, Ky.

M-7

SMITH ENGINEERING WORKS, 504 E. CAPITOL DRIVE, MILWAUKEE, WIS.

YOUR BUSINESS...IS ITS FUTURE SECURE?

EVERY business is exposed to the normal risks of failure through poor management, of destruction by competition, of death through the lack of capital. These hazards have always surrounded business, but in these days they are greater and preventive measures must be correspondingly greater.

To-day's conditions present still other dangers—confiscation through exhorbitant taxation; attacks by competitive industries in addition to competitive producers; the threat of a more class-conscious labor group; the likelihood of stricter regulation of business practices by national and state governments; the challenge of co-operative enterprise.

All these attacks, all these impending dangers, are organized; they represent mass expression of mass sentiment, group pressure for group ends. Does your business face these dangers as a part of industrial organization? Is it prepared, by co-operative association with other similar businesses similarly situated, to meet these newer and more serious threats to its future security? Has it cast its lot with that of its natural indusrial allies, those who, although competitors for your prospects' patronage, are your logical comrades when outside trouble looms?

Or, is your business standing alone, weak, perhaps powerless, because unaided? Have you decided to face the future as the stark individualist, the "lone wolf", determined to fight alone and die alone?

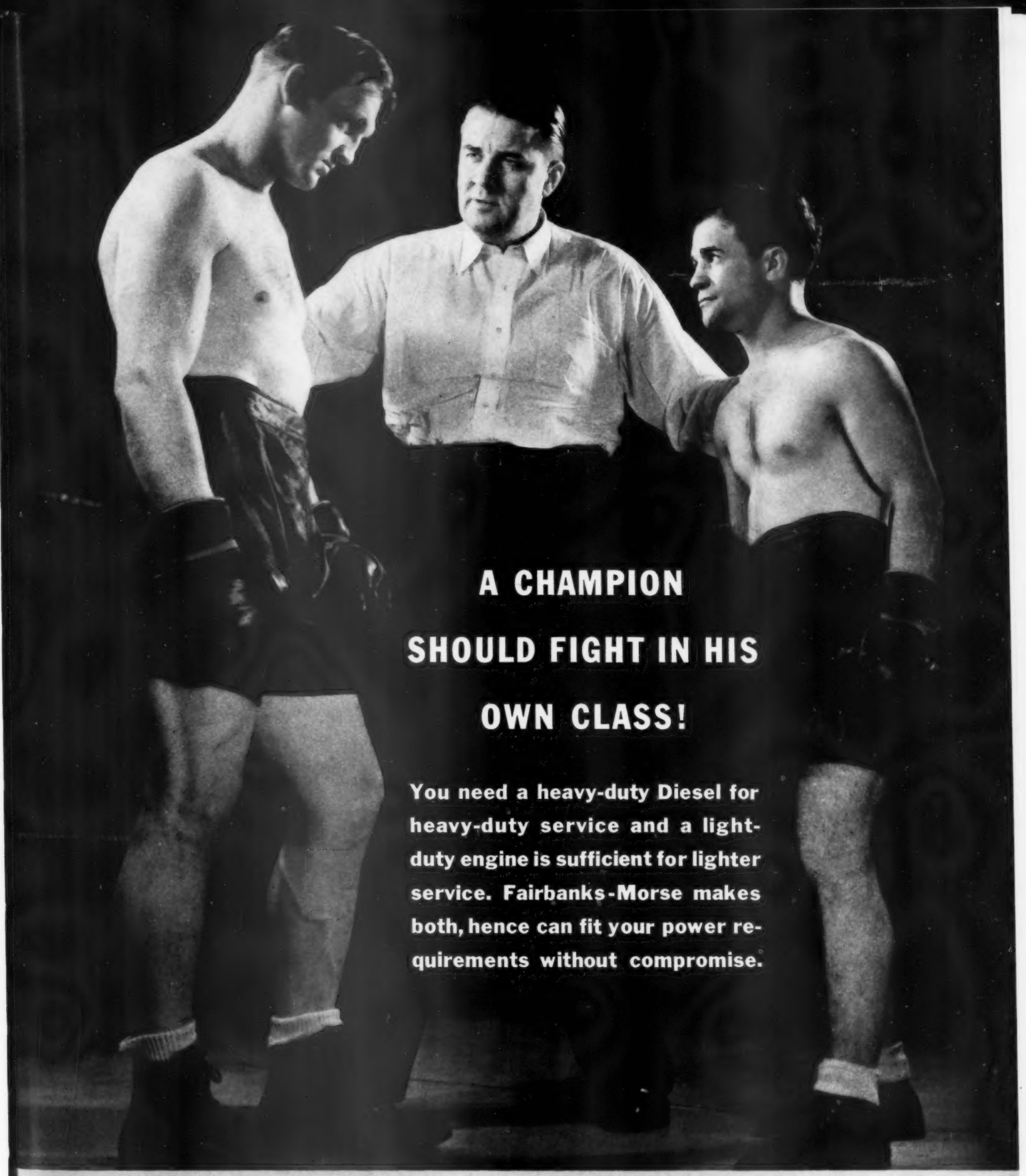
There never was a time when every business stood more in need of the spiritual, financial, even physical support provided by numbers, by co-operative effort, by pooled resources. There never was a time when an individual business—your business, perhaps—could less afford to run the risks that surround all businesses. There never was a time when your business was exposed to more or greater dangers than beset it to-day.

Your industry has a fighting body—an organization watching your interests, working for the betterment of conditions affecting your business, warding off unfair attacks and girding itself for future frays. Join it. Make yourself a part of it. Contribute money and counsel to further its aims. Help it by giving it a share of your courage, strength and determination. . . . And help yourself by placing your future in the hands of those who, acting for you and in your behalf, can serve you, protect you, make your future less insecure, better and more certainly than you could ever hope to do yourself.

You may long have contemplated taking such a step, because surely you often have felt some of the insecurity that is inherent in "going it alone". Hesitate no longer! Organize for defense against the organized dangers that threaten; organize for offense against the many problems that confront you.

If you already belong to your industry's national association, write its secretary a letter telling him why you continue your membership and what benefits you receive from it. Not only will it please and encourage the association's staff, but it might be used effectively to help some non-member decide to join. Helping to get new members is as much a responsibility of membership as the payment of dues.

This advertisement has been prepared and the space for it donated by Pit and Quarry Publications voluntarily in the interest of promoting trade association membership and it appears without the knowledge of any association officer or member.



A CHAMPION SHOULD FIGHT IN HIS OWN CLASS!

You need a heavy-duty Diesel for heavy-duty service and a light-duty engine is sufficient for lighter service. Fairbanks-Morse makes both, hence can fit your power requirements without compromise.

FAIRBANKS MORSE

DIESEL ENGINES
PUMPS
ELECTRICAL MACHINERY
FAIRBANKS SCALES
RAILROAD EQUIPMENT
WATER SYSTEMS
REFRIGERATORS
RADIOS
WASHERS
FARM EQUIPMENT
STOKERS
AIR CONDITIONERS

F M

Diesels

INT IN BINDING

SWING CLUTCHES *that don't* GRAB!

What does this mean to you?

HERE is the most used and abused assembly on any shovel, crane or dragline!—the swing clutches.

Look at these—typical of the Northwest shovel line—*Large Ventilated Swing Clutches* with double cone shaped block frictions simply webbed to assure thorough ventilation and cool running.

Mounted on a heavy alloy steel shaft rolling on ball bearings, they are the ultimate in smooth action and uniform pressure—no jerks, no grabs.

Uniform pressure swing clutches are used on all Northwests. No band clutch either inside or outside type can possibly be a uniform pressure clutch.

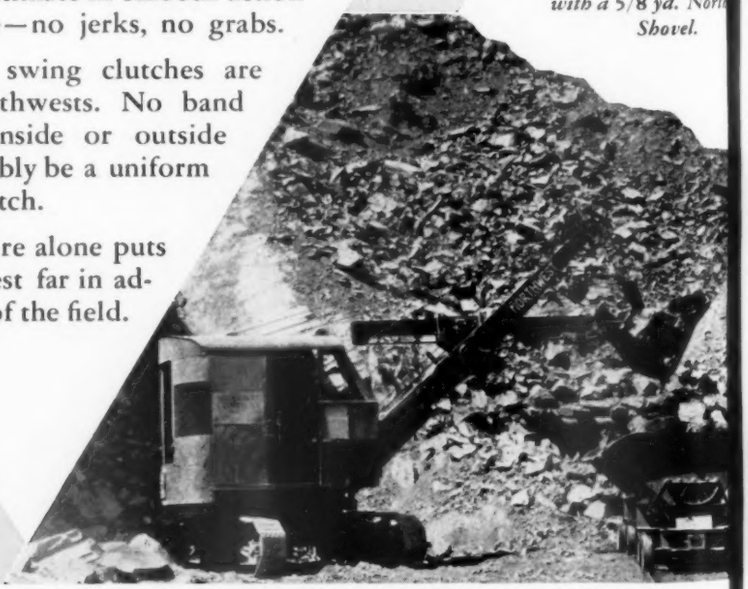
This feature alone puts Northwest far in advance of the field.

NORTHWEST ENGINEERING COMPANY
1822 Steger Building
28 East Jackson Boulevard
Chicago Illinois

GASOLINE • ELECTRIC • DIESEL • OIL

Built in a range of 18 SIZES · 3/8 yd. capacity and Larger

The smaller North... are "Rock Shovels"... Handling quarry... with a 5/8 yd. Nort... Shovel.



NORTHWEST

THE WORLD'S LARGEST EXCLUSIVE BUILDERS OF SHOVELS • CRANES • DRAGLINES •

GREATER GROWTH

HIGHER worth of product, broader industrial research and increase of manufacturing facilities have marked the progress of Republic, year after year.

Long ago, this organization established new standards of quality for Transmission and Conveyor Belting, Hose, Packing and other mechanical rubber products. These high standards of ultimate value, which we have long maintained, are fully appreciated by industry and are bearing their logical fruits in larger and larger demands.

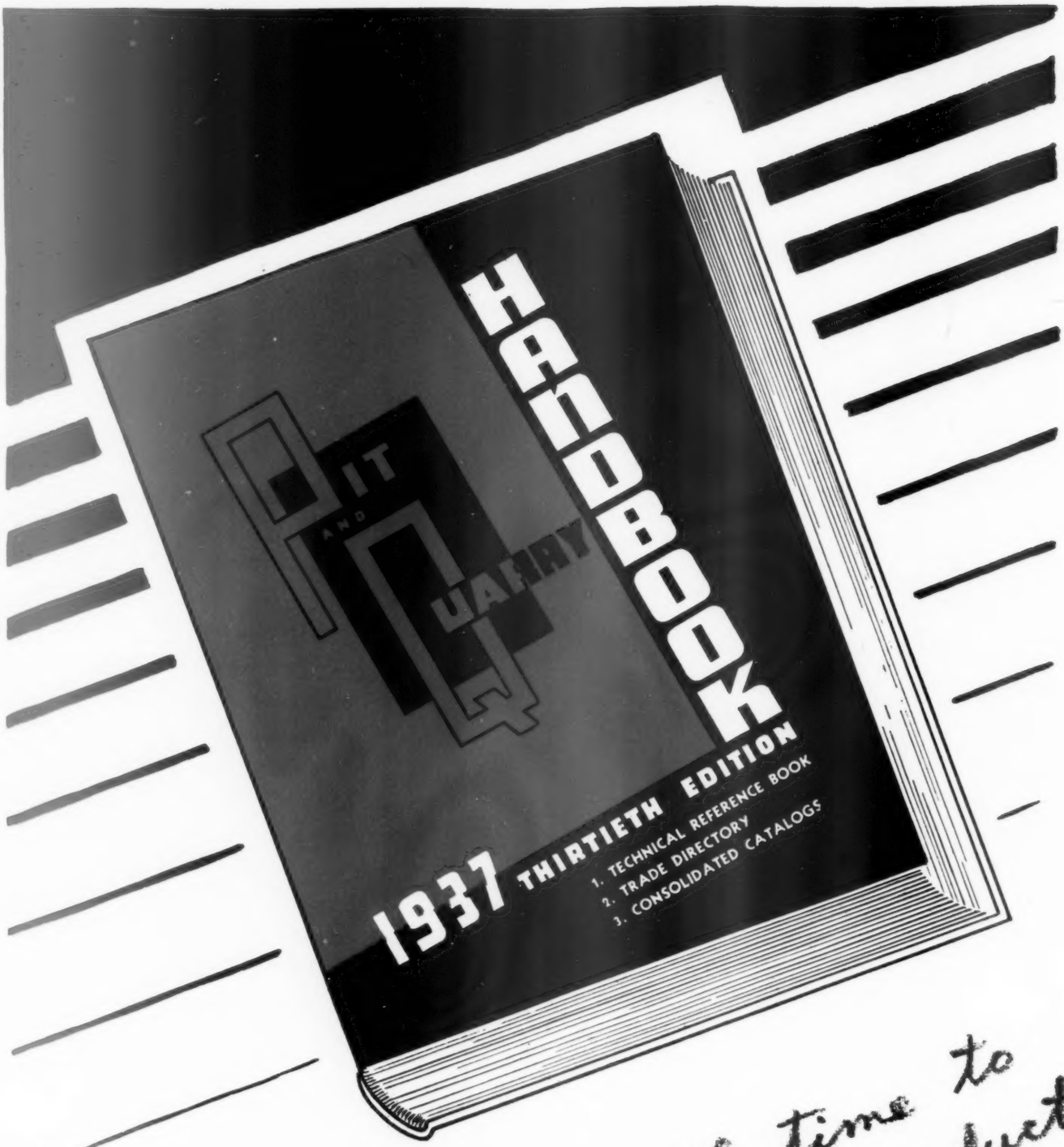
Applied to the particular uses for which they are made, Republic Products are unexcelled in economy and efficient performance.

REPUBLIC RUBBER

Division LEE RUBBER AND TIRE CORPORATION
YOUNGSTOWN • OHIO

Manufacturers of HOSE
BELTING • PACKING
MOLDED PRODUCTS

ORDER REPUBLIC RUBBER PRODUCTS FROM YOUR DISTRIBUTOR



There's still time to Catalog your product! .... write for Rates and Reservations

Here's Your Market for 1938

Pit and Quarry HANDBOOK offers you 100% sales coverage for all of the coming year—a year that business leaders say will continue the sensational come-back for the heavy industries.

Housing programs, road building, land development projects and government construction on a huge scale, all point to an unprecedented demand for basic materials.

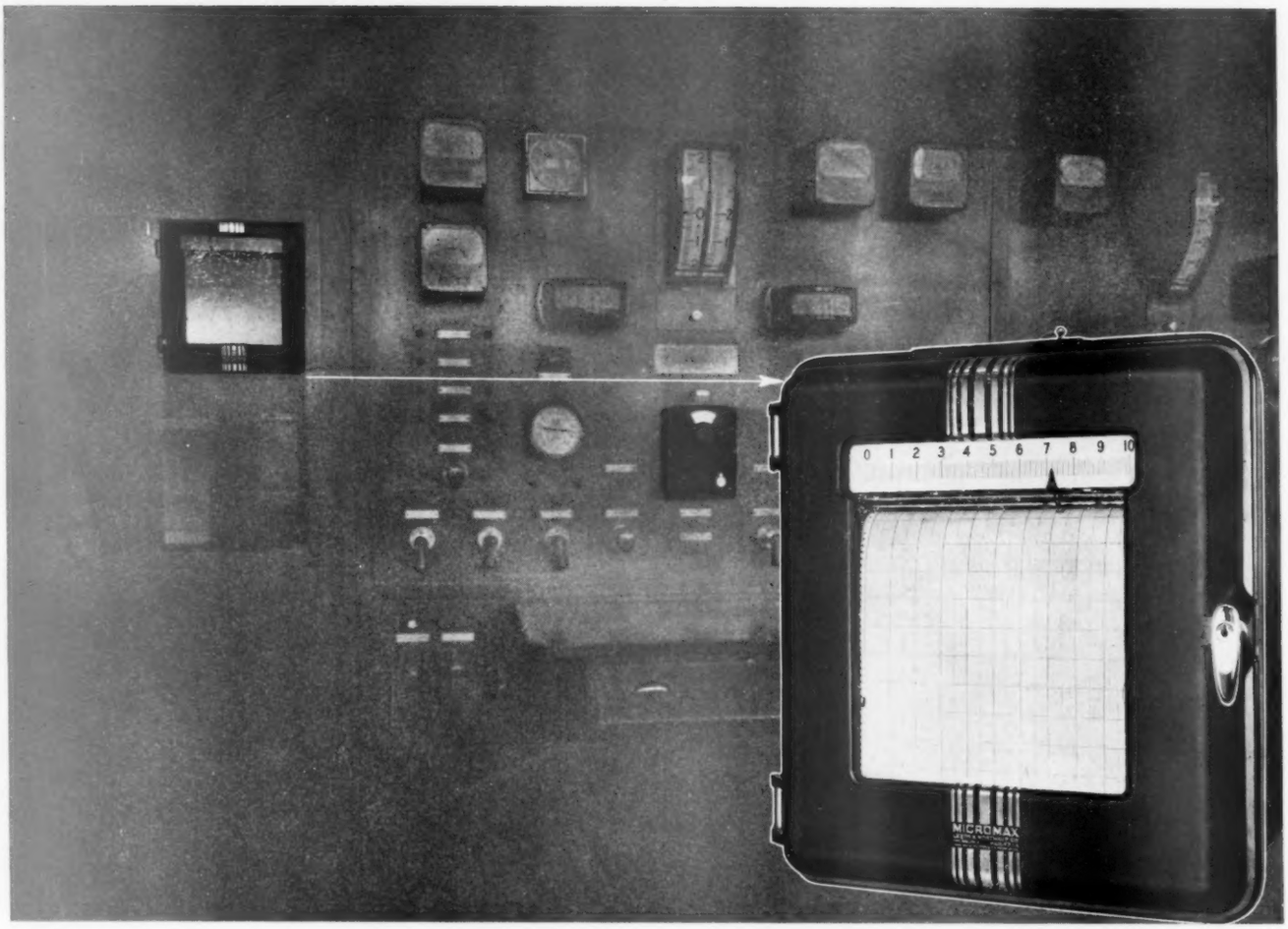
As the one and only Directory of all *producing plants* and *purchasing personnel* in the cement, gypsum, lime, sand, gravel and crushed stone fields, the HANDBOOK is the key to your advertising campaign.

List your entire line in this Buying Manual of the Pit and Quarry Industry—and your sales message will go to every prospect who authorizes or approves purchases in the 5,100 producing plants in the industry.

This is your logical market and your 1938 advertising will not be complete unless you include a page or series of pages in the HANDBOOK to catalog your products.

Act now, before the closing date of publication makes you miss your market.

PIT AND QUARRY PUBLICATIONS
538 SOUTH CLARK ST., CHICAGO



Reliability was the quality that led the use of a Micromax Temperature Recorder and L & N Indicator for the rotary kiln control panel in the Millard plant.

FOR *Dependable* TEMPERATURE FACTS RELY ON MICROMAX PYROMETERS . . .

Much of the lime kiln's use of Micromax Pyrometers is due to the industry's liking for solid, substantial machinery. For Micromax is a machine rather than an instrument; its parts are substantial castings, forgings, stampings and shafts having large safety factors. Bearings are ample. Assembly is careful; tolerances are close and alignments permanent; accuracy and responsiveness are practically unaffected by wear. The operation of this machine is in keeping with the powerful, sure style of the heavy duty machinery of the rock industry. It is available in models that supply temperature indication, record, signals or control in exactly the combination needed for a given application.

J-N33 (11)

LEEDS & NORTHRUP COMPANY, 4977 STENTON AVE., PHILA., PA.

LEEDS & NORTHRUP

MEASURING INSTRUMENTS · TELEMETERS · AUTOMATIC CONTROLS · HEAT-TREATING FURNACES

OCT 25 1937

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PIT AND QUARRY

Vol. 30 October, 1937 No. 4

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MEMBER AUDIT BUREAU OF CIRCULATIONS

Smartly run departments and projects never let up in their hunt for lower operating costs. They seek out savings everywhere. That's why more and more plants switch to HEWITT industrial rubber goods each year . . . and then stick to specifying them. Every HEWITT product is made with an eye to lowering YOUR operating costs. The longer life that HEWITT builds in, the ceaseless search for improved construction, the unending developments that lead to greater standing, all are directed toward that goal. HEWITT Maltese Cross *asbestos construction* Steam Hose, for example, cuts operating costs to bed rock. There are HEWITT distributors located near your plant. They will welcome an opportunity to discuss HEWITT industrial rubber goods on the solid basis of dollars and cents performance. They are listed in the classified telephone directory of industrial centers under "Rubber Goods" or "Belting".

HEWITT

RUBBER CORPORATION BUFFALO N.Y.

HOSE • CONVEYOR AND TRANSMISSION BELTS • PACKING

Florida Cement-Levy Cases Reaches Court

DECISION ON PASSAGE SOUGHT

The Florida Portland Cement Co. has carried to the Florida Supreme Court mandamus proceedings against the state's highway department to compel the department to enforce the $3 per ton levy against imported Portland cement. The bill was passed by the last session of the Florida legislature, sent to the governor, and was then recalled before the legislature adjourned.

Attorneys for the highway department contend that the bill died at adjournment because it had been recalled by the legislature before the governor had a chance to veto or sign it.

P. C. Whitaker, attorney for the cement company, has insisted that the legislature improperly recalled the bill and claims that it automatically became a law ten days after the session without the signature of the governor. The $3 levy, sought to combat the effects of foreign cement which have been imported into Florida in great quantities in recent years, is not a tax but an "inspection fee".

Chicago Syndicate Buys 500-Acre Stone Deposit

A Chicago syndicate has formed the McHenry County Lime & Stone Co., acquired a 500-acre stone deposit near Garden Prairie, Ill., and is preparing to open up a quarry and erect a plant.

New Cement Plant Ready to Operate by Nov. 1

Work on the new cement plant of the Gulf Portland Cement Co. located on the north side of the ship channel at Houston, Tex., is proceeding rapidly, according to Kent B. Diehl, president, and operations are scheduled to begin about Nov. 1 of this year.

The 8-ft. by 220-ft. kiln and the 6-ft. by 120-ft. cooler are installed and four storage silos 65 ft. high with a capacity of 25,000 bbl. have just been completed. Erection has also been completed on a 165-ft. stack. The main mill building was practically complete on Oct. 1.

Modernizes Gravel Plant at Northville, Mich.

The Manning & Locklin Gravel Co., Detroit, Mich., has completed the enlargement and modernization of its plant at Northville, Mich. Dry excavation is now employed, the plant formerly having been a dredging operation. Power shovels are used for digging and loading while haulage is being done by motor trucks.

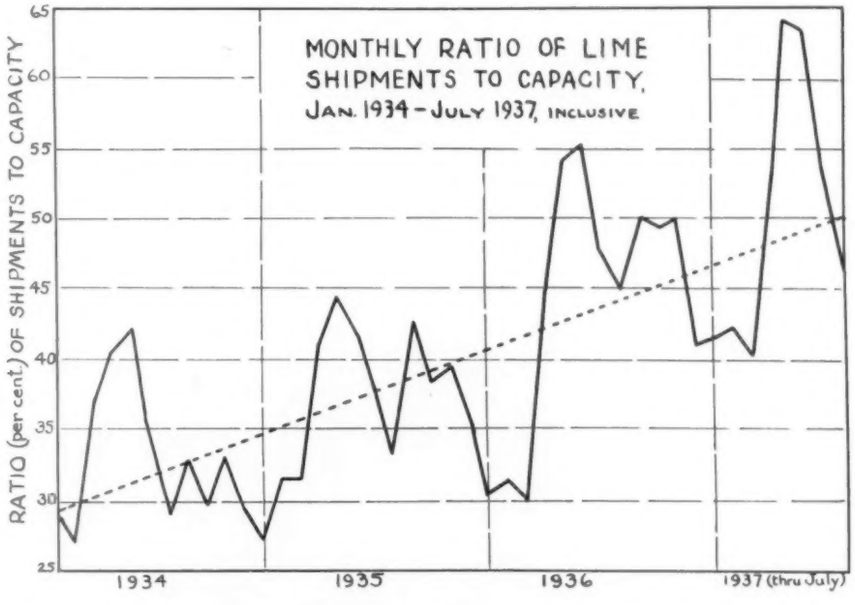
Builds Gravel Plant At East Liverpool, O.

NEW COMPANY ENTERS FIELD

A new sand-and-gravel plant costing $50,000 is under construction near East Liverpool, O., by the recently-formed Negley Sand & Gravel Co. The deposit, a 65-acre tract, was leased for a 30-year period from the Pittsburgh, Lisbon & Western R.R., the lessee retaining an option to purchase the land.

All plant structures are of steel and concrete. A Sauerman Crescent scraper outfit is to be employed to excavate and bring the material to the plant.

Albert E. Frosch, head of the East Liverpool office of the Eastern Ohio Sand & Supply Co., heads the new concern. He will act as general manager of operations.



The above chart, prepared from data compiled by the National Lime Assn., shows the monthly ratio of lime shipments to capacity of plants from January, 1934 through July, 1937. It indicates graphically the seasonal fluctuations characteristic to this industry and also discloses the steady trend upward in the past three and one-half years. The peak appears regularly in April or May with the slump which follows being halted by August. With equal regularity the industry is also shown subject to low demand during the winter months.

Low-Heat Cement for Mexican Dam Project

CEMENTO NACIONAL TO EXPAND

A contract has been let by the Department of Irrigation of the Mexican Government to Cemento Portland Nacional, S. A., Hermosillo, Sonora, Mexico, for low-heat cement to be used in the La Angostura Dam, which is the first of four dams that make up the Yaqui Valley Project, which, when completed, will irrigate 300,000 acres in the Yaqui Valley and generate hydraulic power at different places to be used by industrial and mining enterprises. The Yaqui Valley itself will use a large amount of power once the irrigation is available.

The contract calls for 46,500 tons of low-heat cement, about 275,000 bbl. In addition to this the dam will require some commercial cement which will also be furnished by the company. Deliveries are to start January 1, 1938, and the whole dam is to be completed by the middle of 1940.

The Cemento Portland Nacional, S. A. is now considering the construction of additional silos, slurry tanks, and flat storage for sacked cement, as the contract calls for a considerable amount of cement and clinker to be carried in reserve. The additional construction will be made by the Macdonald Engineering Co. of Chicago, Ill., through its San Francisco branch, which designed and constructed this plant originally. A general check-up of all the equipment is now being made for any replacement of parts that may be necessary. The cement-making equipment was furnished by the Traylor Engineering & Manufacturing Co. and the power-house was equipped by the Worthington Co.

This plant has been operating at 25 per cent. capacity because of the limited consumption in this territory. This contract will make it possible to operate at very nearly 100 per cent. capacity. This will be the first plant in Mexico to manufacture low-heat cement in such quantities.

Hold Safety Congress at Kansas City, Oct. 11—15

The 26th annual safety congress, sponsored by the National Safety Council, will be held Oct. 11-15 at Kansas City, Mo.

The Quarry and Cement Sections will meet Oct. 12, 13 and 14. Speakers will include A. J. R. Curtis of the Portland Cement Assn. and W. W. Deadman, superintendent, Bonner Springs, Kan., plant, Lone Star Cement Corp. Fred B. Hunt, Nazareth Portland Cement Co., is general chairman of the Cement Section while Alexander Foster, Jr., Warner Co., heads the Quarry Section.

Unions Sign Agreement in Northern California

The Rock, Sand and Gravel Producers Assn. of Northern California, embracing 11 counties, has signed agreements with unions covering labor employed by producers in that area.

The agreement which is in effect until July 16, 1938, provides for the closed-shop and union regulations throughout that area.

Designed by engineers of R. G. Le Tourneau, Inc., Peoria, Ill., for its own use the above all-welded hexagonal-shaped dredge has unusually high capacity—3,000 gal per min.—for its size, 33 ft. long, 24 ft. wide and 5 ft. deep. Instead of maneuvering by anchor lines, it is shifted rapidly by power-control-unit lines. Anchored by one spud it can travel in an arc of 150 deg. The 10-in. pump is driven by a Caterpillar Diesel engine.

Industrial Minerals Meeting at Capital

PART OF A. I. M. E. GATHERING

The fall meeting of the industrial-minerals division of the American Institute of Mining and Metallurgical Engineers will be held at Washington, D. C., and College Park, Md., in coöperation with the Washington, D. C., section of the A.I.M.E., the U. S. Bureau of Mines, and the University of Maryland. The meeting is limited to two days, Thursday and Friday, Oct. 14 and 15. On Thursday, members of the four organizations and their guests will assemble at the Wardman Park Hotel, Washington, which has been designated as official headquarters. It is planned to have two technical sessions, one in the forenoon and one in the afternoon. There will be a buffet luncheon between sessions and an informal dinner in the evening.

On Friday forenoon the members and guests will assemble in the auditorium of the University of Maryland for a technical session, at which the papers presented will deal with the work of the Bureau of Mines as carried on at its new Eastern Experiment Station on the campus of the University of Maryland. Following the technical session, there will be an informal luncheon.

Among the speakers at the sessions will be R. W. Smith, chemist, Peerless White Lime Co., St. Genevieve, Mo., who will discuss his company's mining methods; Stanton Walker of the National Sand & Gravel Assn. whose topic is *Sand and Gravel Products, Specifications and Reasons;* and E. L. Spain and N. A. Rose, who will offer a geological study of gravel aggregates of the Tennessee River.

Ready-Mix Operation in Indiana Proves Success

Nearing the end of its first year in the ready-mixed-concrete business in a city of 40,000, the McVaugh Ready Mixed Concrete Co., Anderson, Ind., is operating three truck-mixers and has had a highly successful season, according to Frank McVaugh, head of the concern.

Mr. McVaugh, formerly county surveyor and a building contractor, has supplied all the concrete for several large industrial and commercial buildings erected at Anderson this summer.

★ Canada Vitrified Products, Ltd., St. Thomas, Ont., is installing an additional boiler at its plant.

Building in August Smaller Than July

IS 4% HIGHER THAN A YEAR AGO

The August record of total construction in the 37 eastern states amounted to $285,104,100, as reported by F. W. Dodge Corp. This contract volume compares with $275,281,400 for August of last year and with $321,602,700 for July of this year.

Of the August, 1937 volume, $73,448,300 represented residential building, $117,209,800 non-residential building and $94,446,000 was for public works and utilities.

Commenting about the August construction total, T. S. Holden, vice-president of Dodge Corp., stated: "Approximately two-thirds of the July-to-August decline in contracts was due to a decrease in the amount of publicly-financed work. In addition, there occurred, also, a drop of more than $30,000,000 in the total for unusually large projects, jobs costing a million dollars and over and which happened to start during July rather than during August. In spite of these two adverse influences, the August total represented a gain of 4 per cent. over last year and a decline of less than 11 per cent. from July of this year.

"Disappointment in the August residential building total is not so great as would be indicated by the contract figures. Admittedly, residential contracts fell below the total for the corresponding month of the previous year for the first time during the recovery period, but the August, 1936 record was inflated by public housing amounting to almost $32,000,000. In the current month's record there was included less than $1,000,000 of public housing. Consequently, private residential building shows a 6 per cent. gain over August of last year."

Slide Engulfs Gravel Plant, Forcing Move

More than a year ago, engineers of the U. S. Bureau of Mines were unable to fathom the cause of a mysterious land slide at the plant of the Latta Brook Sand & Gravel Co. near Elmira, N. Y. Since that time experts have offered their opinions but none was able to suggest a remedy to halt the slow-moving earth descending on $50,000 worth of machinery.

Now, according to Glenn R. Weigand, treasurer and general manager of the company, the company has leased a new deposit near Horseheads, N. Y. and the plant and equipment are being moved to the new location before it is completely engulfed.

While the cause of the sinking earth has not been officially determined, the theory that a subterranean stream has formed a hidden lake far below the surface and is absorbing the gravel as it sinks is most generally accepted.

Another theory is that the washing of gravel over a period of years has formed a stratum of soft mud which has tended to weaken the side-hill foundation.

Children Enjoy Happy Vacation on Catalina

Eighty-two happy children of the employees of the Monolith Portland Cement Co., Monolith, Cal., spent an enjoyable week on Catalina Island recently. The trip and the accommodations on the island were arranged for and all expenses paid by the cement company.

Heading the supervisory group of adults who accompanied the children was Mrs. Coy Burnett, wife of the president of the Monolith company. Special railroad cars carried the party to and from the steamer dock.

Paper Mill Buys Kiln for Recovery of Lime

The Southern Kraft Co. has just placed another order with Allis-Chalmers Mfg. Co., Milwaukee, Wis., for a large rotary kiln costing $62,500. This will be installed in the above company's new paper mill at Spring Hill, La., where it will be used in the recovery of lime in its chemical pulp mill. This kiln will be 11 ft. in diameter and 250 ft. long and will be the largest ever supplied to the paper mill industry.

T.V.A. Acquires Tract of Phosphate Deposits

The Tennessee Valley Authority has purchased 338 acres of phosphate deposits and leased the mineral rights to an adjoining 215 acres in Williamson County, Tennessee, from the International Agricultural Corp.

The amount involved in the transaction was $678,000, according to reports.

★ Extensive improvements which, it is reported, will double the capacity of its lime-hydrating plant are being made by the Southern States Lime Lime Corp., Crab Orchard, Tenn.

This Diamond portable crushing-and-screening plant is operated by the Wyoming Highway Dept. at Rawlins, Wyo., with production running 350 to 400 tons daily. Fuel cost per day is only about $2 with a Caterpillar Diesel engine supplying the power.

Installs Equipment in Numerous Cement Plants

★ According to the Bradley Pulverizer Co., installations of Bradley Hercules mills have been made in the following cement plants this year: Trinity, Eagle Ford, Tex.; Dewey, Dewey, Okla.; Hercules, Hercules, Pa.; Medusa, Bay Bridge, O., and Dixon, Ill.; and the plant at Rapid City, S. D., operated by the state of South Dakota. Two plants, the Century Cement Co., Rosendale, N. Y., and Lehigh at Fogelsville, Pa., have installed Griffin mills. Two Pennsylvania-Dixie plants—Richard City, Tenn., and Bath, Pa.—have added Bradley air-separators as have also the Giant Portland Cement Co. plant at Egypt, Pa., and Lone Star's, Hudson, N. Y., plant.

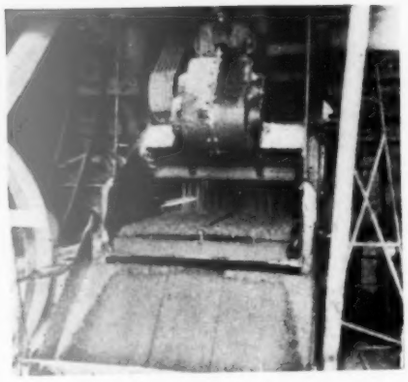
Reopens Ballast Plant near Cheyenne, Wyo.

The Colorado & Southern Railroad has reopened its gravel pit seven miles west of Cheyenne, Wyo., after having closed the pit for a month. It was reopened because of need for ballast materials on the road's system. Fifteen men and one drag-line are working.

Jails Two for Violating Kansas City Injunction

Two former employees of the Kansas City Quarries Co., Jack Wheeler and Delfert Gaston were given 10-day jail sentences for contempt of court recently when they violated a federal injunction against interference with the company's operations.

The case is one of the aftermaths of the labor strife which has annoyed Kansas City operators for several months.



This triple-deck 4-ft. by 12-ft. Allis Chalmers vibrating screen was recently placed in service at the plant of the Erie Stone Co., Bluffton, Ind.

Highway-Research Plant to Rise in Virginia

Plans for the research station of the Bureau of Public Roads at Abingdon, Va., have recently been completed. Bids are being called for and will be opened on October 18. Construction should begin soon thereafter.

The new site at Abingdon consists of 54 acres overlooking the Potomac River on the George Washington Memorial Highway. Buildings are to be erected at this time to house the Division of Tests. The buildings are of Colonial design, in keeping with the memorial highway on which they are located.

The left wing of the group of buildings will house bituminous investigations and subgrade-soil research. The right wing will be used for structural tests, concrete investigations and other nonbituminous investigations. A two-story bay in each of these wings will be available for high-testing equipment such as may be used in impact studies and in bridge tests. Air conditioning is to be provided in those rooms where control of humidity and temperature will be of importance in making tests.

Barite Impurities Are Reduced by Flotation

At the Southern Experiment Station of the U. S. Bureau of Mines, Tuscaloosa, Ala., in an investigation of possible methods for eliminating impurities from barite, it was found that iron and silica can be removed almost completely from barite by application of the froth-flotation process. This process is used extensively for concentration of metallic ores, but has not been used as yet on barite or other nonmetallic ores of the Southeastern States. By this process, barite containing only a fraction of 1 per cent. of iron and silica is obtainable from ore of certain deposits in Tennessee and South Carolina which in their original state are too high in these impurities to be of any commercial value and which, therefore, have been unsuitable for exploitation in the past.

Wins Concrete Award on Total Bid of $77,050

The Consumers' Rock & Cement Co., San Francisco, submitted the low total bid of $77,050 to the U. S. Engineers San Francisco office for furnishing 10,000 cu. yd. of ready-mixed concrete. The contract calls for 8,500 cu. yd. of Class A concrete and 1,500 cu. yd. of Class B material.

Other bidders on the contract were as follows: San Francisco Gravel Co., $87,400; Readymix Concrete Co., Ltd., $93,700; and Golden Gate Atlas Materials Co., $97,500.

Grand Coulee Dam Work Year Ahead of Schedule

A trainload of cement and seven trainloads of sand and gravel are used each day in the huge concrete mixers at Grand Coulee Dam.

The Bureau of Reclamation reports that more than 3,500,000 cu. yd. of concrete has been placed in the dam, which is about a year ahead of schedule. With excavation completed, the M.W.A.K. Co. is concentrating on placement of concrete, operating two mixing plants, one on the west and the other on the east wall of the Columbia River canyon.

Cement is being received at the dam at the rate of about 95,000 bbl. per week, or about 60 carloads a day.

New Agricultural-Stone Plant near Jackson, Mo.

Charles Leimer has started operation of a limestone-crushing plant at the quarries of M. A. Short, Jackson, Mo. Mr. Leimer has an initial order for 5,000 cu. yd. of agricultural limestone from the county farm bureau, under the soil conservation program, and will also crush and screen commercial stone for construction purposes.

★Brand & Deal, sand-and-gravel producers of Elkhart, Ind., recently purchased a 38-V Pioneer portable crushing and screening plant. According to C. C. Deal, one of the members of the firm, the outfit will be used in northeastern Indiana.

Surveys Underground Loading Equipment

CURRENT TRENDS ARE REVEALED

According to a survey entitled *Mechanization Trends in Metal and Nonmetal Mining as Indicated by Sales of Underground Loading Equipment*, published by the W.P.A. as a research project, the distribution of loading equipment in nonmetallic-mineral mines is largely concentrated in the Mississippi Valley and the East. The types of equipment chiefly used consist of power shovels or smaller mobile-type loaders, though scrapers also are widely distributed.

The industries making greatest use of such equipment are underground limestone and rock-salt mining. The metal miner is not always aware that the production of limestone underground grew from 1,670,000 tons in 1912 to 11,100,000 tons in the active year 1929. Some of this production is obtained from steeply pitching beds by shrinkage methods and gravity loading, but the greater part is loaded with underground power shovels. Loading machinery has also been used, sometimes experimentally, in the underground mining of fire-clay, silica rock, glass sand, building sand, gypsum, phosphate rock, ocher, pyrites, rock asphalt, fluorspar, and diatomaceous silica rock. Its most recent application is in the mining of potash in the newly-developing industry at Carlsbad, N. M., where 98 per cent. of the output is produced with loading machines and scrapers.

The trends in mining practice suggested by the sales of equipment indicate an active interest in the problems of mechanization and point to the need for studies of operating experience in the application of machines under the widely varying conditions faced by the practical miner. More time studies of mechanical loading are needed, especially of loading in development work. The mass experience recorded in statistics is never a substitute for such individual analysis, but it may furnish a useful background. With the hope of providing such a background, the Bureau of Mines is adding to its annual reports of mine operation inquiries regarding the number and type of machines used and of the tonnage of mineral mechanically handled. A continuing analysis of the factors of mechanical equipment, mining practice, and man-hours per ton will, it is hoped, throw light on the current trends of mineral technology.

Nationwide Plan for Toll Roads Proposed

WOULD BE PRIVATELY BUILT

A gridwork of superhighways to cover the whole Nation will be considered by the House Interstate Commerce Committee in a series of hearings to be held late this year, according to Chairman Clarence F. Lea. The impulse for the action is supplied by a plan suggested by Representative Ira W. Drew of Pennsylvania.

Congressman Drew proposes that the federal government authorize a group of builders and financiers whom he sponsors to build at least 1,300 mi. of superhighway as a private enterprise, and that the company be given a long-time franchise to collect tolls for the use of the roads.

No figures are available, the whole plan being in a tentative form, but Chairman Lea believes the road-building program will be one of the greatest individual enterprises of the kind ever suggested in this country. It is the plan of the Interstate Commerce Committee of the House to consider all suggestions for the building of superhighways and similar plans. The idea is to gather all the various bills that have been proposed during the past year and request their sponsors to come before the committee to discuss their ideas in detail and with as much information as may be obtained or prepared. Chairman Lea urges that every person interested in the industry of building highways, or anybody capable of discussing the problem from a technical standpoint, or from the standpoint of economics or sociology, communicate with the committee and arrange to participate in the hearings.

It appears to be the purpose of the committee to prepare a bill to submit to the Congress for the construction of the superhighway system. There seems to be every reason to believe that the Congress will receive the bill with sympathy, and that it will enact the necessary legislation to authorize a comprehensive program. Apparently there is a sentiment in the Congress that superhighway building is highly popular and highly desirable from almost every viewpoint. Chairman Lea seems to feel it may help to equalize the distribution of industrial population by creating new centers of industry, transportation, and markets, and that the superhighway system may spread population in urban and suburban communities in such ways as to take the pressure away from population centers overcrowded by present methods of transportation.

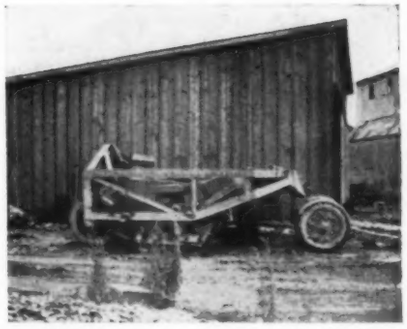
The main idea behind the superhighway suggested in the Congress is to provide on a large scale lanes of traffic for commercial transportation, making possible high speeds, safety and the minimum of policing. It has been suggested these highways should have four to eight lanes, each 12 ft. wide and with overhead or underground crossings with highways or railways. Trucks and other slow-moving vehicles will be segregated into their own lanes. Opposing traffic lanes are to be separated. Speed will be limited only by the capacity of the vehicle and its driver. The highways are to be built to carry traffic at top speeds approximating 100 mi. per hr. Chairman Lea says the main idea seems to be to encourage free movement, liberty of speed, to move loads from place to place with the maximum of uninterrupted flow. The superhighways will, of course, avoid directly all cities and towns.

Part of the plan to be considered by the committee will be a still larger system of main trunk highways to feed traffic into the superhighways. These will serve intercity traffic as well as the flow of traffic between states and regions. The primary trunks will be 10 to 12 ft. wide, the opposing lanes separated. There are to be grade separations at railways and at intersecting highways. The outskirts, rather than the built-up sections, of the cities and towns are to be served. The secondary main trunks will be designed to supplement the primary main trunks.

The Bureau of Public Roads of the U. S. Department of Agriculture recently announced that collections from state gasoline taxes, motor vehicle registration fees, and motor carrier taxes amounted to over a billion dollars last year. State highways absorbed $583,616,000. Other uses were $36,500,000 for relief of unemployment; $89,000,000 to general state, county and municipal funds; $33,000,000 for education; and $11,000,000 for such purposes as airports, navigation, non-highway debts, irrigation, etc.

Glass-Making Boom Aids Silica Industry

The extended use of glass has led to a wider demand for the raw materials used in glass manufacture, the U. S. Bureau of Mines points out. As silica is the principal constituent, a new outlet for by-product silica is anticipated. A china-clay company in North Carolina has recently made a shipment of by-product silica to a glass-block factory. Feldspar producers are giving thought to the possibility of thus utilizing the large quantities of quartz that occur with feldspar in pagmatite dikes. A larger market for by-product quartz would give impetus to the development of froth-flotation processes for separating feldspar from quartz and thus encourage the exploitation of low-grade feldspar deposits.



A recent addition to the equipment of the Miami Stone Co., Delaware, O., is this Austin-Western 5-cu. yd. scraper. It is being used for stripping and other dirt- and material-handling service.

Installs Equipment for Agstone Production

Quarry waste at the operations of the Hoosac Valley Lime Co., Adams, Mass., is now being converted into agricultural limestone following the installation of pulverizing and other equipment at the plant.

The new department began operating in September.

Irrigation Project Uses Much Concrete Pipe

North of Soledad, Cal., on the Thorpe Ranch, 105,000 lineal ft. of 18-in. and 24-in. concrete irrigation pipe is being furnished and installed by the Salinas Valley Concrete Pipe Co. This is equivalent to nearly 20 miles of pipe.

Rebuilds Gravel Plant in Wisconsin After Fire

The plant of the Wissota Sand & Gravel Co., Haugen, Wis., has been completely rebuilt, after a fire in June, which caused damage estimated at $60,000. The output of the new plant is averaging 50 cars of gravel per day.

★ Production has been halted at the Bonner Springs, Kan., plant of the Lone Star Cement Corp. while air-separating equipment is being installed in the finish-grinding department.

New roll-crusher, built by the New Holland Machine Co., New Holland, Pa., being installed in the plant of the Hurst Sand & Gravel Co., Dayton, O.

Output of Feldspar Shows Slight Decline

Notwithstanding further substantial improvement in the production of glass containers, sales of ground feldspar to the glass industry during the first six months of 1937, as reported by the National Feldspar Assn., declined slightly compared with the corresponding period of 1936. Deliveries of enamel spar, however, rose 10 per cent. and shipments of pottery spar jumped 30 per cent. so that total shipments as reported by the association aggregated 120,103 short tons compared with 107,269 tons in the January-June period of last year, an increase of 12 per cent. Inasmuch as 1936 was a record year, the current showing of the industry is gratifying, and for the present, at least, any invasion of the glass trade by competitive materials is more than offset by recovery in the demand from other industries that call for higher-priced grades of spar.

Manitowoc Reconditions Diesel Cargo Carrier

The Manitowoc Portland Cement Co., Manitowoc, Wis., has overhauled its Diesel-driven cargo-carrier, the *Daniel McCool* and the vessel has again gone into service on the Great Lakes.

Erects Small Plant to Process Syenite Rock

The Canadian Nepheline Co., Ltd., organized in 1935 to acquire a large deposit of the syenite rock in Methuen township, Peterborough county, Ontario, has erected a small grinding and cleaning plant at Lakefield, about 26 miles from the quarry. The plant, which is in the nature of a demonstration unit, has a capacity of about 25 tons of finished product a day, and has been in steady operation for slightly over a year. The demand for the plant's ceramic products has shown a steady increase.

Considerable prospecting is now being carried out to determine the commercial possibilities of large bodies of nepheline syenite which exist in the central Ontario region, mainly in Peterborough and Hastings Counties, about five miles north of Lake Ontario.

Cowell Resumes Work; A. F. of L. Recognized

After a six-weeks' shutdown, with C.I.O. representatives picketing the plant, the Cowell Portland Cement co. at Martinez, Cal., has resumed operations. Recognition was given the A. F. of L., however, according to Supt. W. H. George.

Gravel Plant Overhauled to Supply Road Material

The gravel plant of the Umpqua River Navigation Co. at Reedsport, Ore., has been overhauled and put in readiness to supply the gravel to be used in the improvement of the Umpqua highway between Reedsport and Scottsburg. John Dolan is foreman of the Reedsport plant.

Starts Production of Ready-Mixed Concrete

Ready-mixed concrete is now being produced at Logansport, Ind., by the San-Gra-Stone Co. The batching plant is located at Water St. and the Pennsylvania R.R. right-of-way.

New Firm Takes Over Saba & Lydon Plant

The Glendale Sand & Stone Co. has been formed at Scranton, Pa., to take over the plant and other assets of the sand-and-gravel business formerly operated by the Saba & Lydon Co.

Arkansas Operator in Ready-Mix Business

The Arkhola Sand & Gravel Co., Fort Smith, Ark., has gone into the ready-mixed-concrete business.

Two mixer-trucks are being used at present, materials being proportioned at the company's gravel plant.

★ The Harbison-Walker Refractories Co., Pittsburgh, Pa., has installed a Hardinge rod mill at its plant at Hays, Pa., near Pittsburgh.

Allentown Observes 175th Anniversary

CEMENT INDUSTRY'S "CAPITAL"

Allentown, Pa., capital of the Lehigh Valley District, chief Portland-cement producing center of the world, is this year celebrating Founder's Week, commemorating the 175th anniversary of the founding of Allentown and the 125th anniversary of the formation of Lehigh County.

With nearly a score of cement plants operating in the district and a generous share of other nonmetallic-mineral operations — lime, crushed stone, crushed slag predominating— Allentown's growth and prosperity have been founded on the prosperity of these industries. Since the first bag of Portland cement was manufactured at Coplay, Pa., 65 years ago, the Lehigh Valley District has played a conspicuous *röle* in the age of concrete—in road-building, in the building of homes, great commercial, public and industrial structures, in the erection of huge dams and bridges.

The cement rock of the district, ideal for the making of Portland cement, was used in quantities even earlier in the manufacture of natural cement. Large amounts of the natural product were produced at Lehigh Gap in 1826 and employed in the construction of the Lehigh Canal.

When the Pennsylvania Germans came into the valley of the Lehigh they found outcroppings of limestone. For two centuries they have prospered in agriculture, sweetening the soil with burned lime. Thousands of lime-kilns once dotted the area with hardly a farm which did not possess a rude kiln for burning lime for its own use. Ruins of these kilns still exist throughout the valley and modern, commercial lime plants have taken their place producing quality materials under close control.

Two important makers of equipment, whose products are found in use not only in the immediate vicinity but throughout the mines, pits and quarries of the United States and the world are also located at Allentown. The Traylor Engineering Mfg. Co. broke ground for the first building of its Allentown plant in 1906. Its chief products are crushing, grinding and burning machinery. Another famous firm manufacturing grinding and air-separating equipment is the Bradley Pulverizer Co., which moved its plant from Boston to Allentown 22 years ago.

National Crushed Stone Assn.
National Lime Assn.
National Slag Assn.
Portland Cement Assn.

WITH THE TRADE ASSOCIATIONS

National Sand & Gravel Assn.
National Industrial Sand Assn.
National Ready Mixed Concrete Assn.

October, 1937

June Campaign Sets New P.C.A. Safety Record

A tabulation of industrial accidents in 150 Portland-cement plants during the month of June, recently compiled by the Portland Cement Assn., reveals a new all-time low accident record for the cement industry. During June, 135 of the 150 plants operated one of the busiest months of the year without a single lost-time accident. The other 15 plants had but 17 accidents —making a total record of only four employees injured for each million man-hours worked. This surpasses the record of June, 1936, when employment and operation were below that of the current year and accidents were twice as numerous.

The new record of but four men injured per million man-hours worked is three and one-third times as good as the average of 13.57 persons injured per million man-hours reported to the National Safety Council by 30 major industries at the end of 1936. The record set by the cement industry in June is equivalent to 156 safe working years between accidents based on 40 working weeks to the year. While results in June can be attributed to the special campaign directed by the Accident Prevention Bureau of the association, the effectiveness of the industry's drive for safety among its employees can be measured by the fact that for the first six months of 1937 accidents have been reduced one-fourth from the same period last year.

Ready-Mixed and Gravel Convention Dates Same

During the past several years, the annual convention of the National Ready Mixed Concrete Assn. has followed the annual convention of the National Sand & Gravel Assn., the two conventions taking an entire week. This was the case at Memphis last December.

Next January, however, as the result of representations to the National Sand & Gravel Assn., the annual meetings of the sand-and-gravel and ready-mixed-concrete industries will be held at the same time (Feb. 1-3) thus preserving the appearance of the exhibit and reducing the number of days which members of the Manufacturers' Division will require in order to make and renew their acquaintances in these two important businesses.

Association Meeting Earlier This Year

According to an announcement by General Manager Wm. M. Kinney, the annual meeting of the Portland Cement Assn. will be held in Chicago beginning Monday, November 29 and extending through December 1.

The Blackstone Hotel has again been selected as the meeting place. These dates place the meeting two weeks earlier than have been those of the last two years.

Coming Events

November 29—December 1, 1937, Chicago, Ill. — Annual meeting, Portland Cement Assn., Blackstone Hotel.

January 17-22, 1938, Cleveland, Ohio. — Annual Road Show, American Road Builders' Assn., Cleveland Auditorium.

January 24-26, 1938, Cincinnati, Ohio. — Twenty-first annual convention and machinery exhibition, National Crushed Stone Assn., Netherland Plaza Hotel.

February 1-3, 1938, Cincinnati, Ohio. — Twenty-second annual convention and machinery exhibition, National Sand & Gravel Assn., Netherland Plaza Hotel.

February 1-3, 1938, Cincinnati, Ohio. — Annual convention and machinery exhibition, National Ready Mixed Concrete Assn., Netherland Plaza Hotel.

Krause Quarry Completes 5 Years Without Mishap

The National Crushed Stone Assn. safety competition covering the calendar year 1936 was the eleventh yearly safety contest conducted by the United States Bureau of Mines in coöperation with the National Crushed Stone Assn. There were 54 plants, consisting of four underground mines and fifty open quarries located in 17 states, that participated in the contest, and of these, fourteen worked a total of 1,135,633 man-hours during the year without an accident causing loss of time to any of the employees. The records reveal that 6,733,950 man-hours of work was accomplished during the year, which was 55 per cent. more than that represented by the enrollment in the previous year's contest.

The trophy for 1936 was won by the Krause No. 1 quarry, near Columbia, Ill., operated by the Columbia Quarry Co. The quarry worked 224,342 man-hours without a lost-time accident. This plant has established an accident-free record of 726,998 man-hours during the past four years, 1933 to 1936 inclusive; and during that period the plant was awarded the trophy in 1935 and honorable mention in 1933 and 1934.

Word from E. J. Krause, president of the Columbia Quarry Co., indicates that this quarry at the close of work on Sept. 22 completed five consecutive years without a lost-time accident for a total of 928,675 man-hours. No other quarry in steady production has achieved a similar officiel record.

N.Y. Crushed-Stone Men Enjoy Outing at Albany

The New York State Crushed Stone Assn. held its annual late-summer meeting and outing Friday, Sept. 17, at Schuyler Meadows Golf Club, Albany, N. Y.

Recent developments in dust-control regulations and a discussion of labor conditions were the high spots of the business meeting. Golf and horseshoe-pitching contests were enjoyed after the luncheon.

. . . Editorial . . . . . .

Unemployment Is a Social Danger

WHATEVER one's attitude toward the subject of unemployment may be, the problem is one of great seriousness, and in arriving at this conclusion one can utterly ignore its humanitarian aspects. Considered only in its economic effects, looked at only from the "practical" viewpoint of the hard-headed business man, present unemployment stands in the way of the further improvement that business men expect, and if it is allowed to continue or to grow may not only impair the rate of profit in business enterprise but may attack the very foundations of the profit system. Unemployment is a crisis in the lives of those who bear its burdens; it may also be a crisis in the ife of the capitalistic economy. It has effected marked changes in the political and economic arrangements in some highly industrialized countries; it is not impossible that it may have similar effects here. This possibility approaches so close to probability that the duty of giving the problem the most careful and personally disinterested study rests upon each one of us.

There are several kinds of unemployment which fall naturally into classes determined by their causes. One variety is that called "normal" by some laymen as well as economists, unemployment which is by them considered to be an inevitable condition in an economic system which grants to every worker the right to seek and quit work and change the place of his employment at will. This condition they hold to be universal and so inevitable that Pigou calls it "an intractable minimum below which the percentage of unemployment never falls", while Beveridge characterizes it as "an irreducible minimum of unemployment".

Another variety, and one which in many industries may for a long time continue to be more or less inevitable is seasonal in character. Our own industries and others affected by climatic conditions or the whims of fashion are examples.

Unemployment due to economic crises is another kind of which the years since 1929 have provided an example of the greatest magnitude. If one accepts the theory that economic depressions are cyclical and therefore inevitable, he can hardly escape the conclusion that cyclical unemployment, their most conspicuous and disastrous result, is unavoidable.

Technological unemployment, that due to the displacement of human labor by labor-saving machinery, is the kind that has provoked the most discussion in recent years among laymen. Its effects, no more fully understood than its causes, may possibly become more serious than those of some of the other varieties, because technological advance is certain to proceed at an even faster rate than that observed in recent decades and unless new work opportunities sufficient to absorb all the workers displaced by new technical developments are provided the technological-unemployment curve will rise still more rapidly in the future.

THE causes of unemployment should be studied carefully, calmly and with as little subjective bias as possible and every business man who employs labor should participate. He may feel no personal interest in the problem, except perhaps on occasions when the prevalence of unemployment may tend to make labor quickly and cheaply available, yet its effects may fall very heavily on his business and its future. He need not be a producer nor a purveyor of so-called consumer goods to feel the strangling pressure of unemployment, for the producer of the capital goods used in the manufacture of the necessaries becomes, through his dependence on the purchasing power of the consumer-goods industries, dependent ultimately on the purchasing power of the masses. In cyclical economic crises, which exact such heavy penalties of the capital-goods industries, it is the falling-off in orders for manufactured commodities that makes their producers fearful of buying the new equipment or the replacement parts that keep the capital-goods industries alive. And it is the laying-off of workers by these not-unreasonably cautious makers of capital goods that ultimately raises cyclical unemployment to socially and economically dangerous heights.

The manufacturer of heavy machinery,

and no less the producer of the raw materials of all types of construction and fabrication, suffer heavily in a period characterized by widespread unemployment. The merchant selling shoes, hairpins, meat, or motor cars is the first to feel the pinch of a public purchasing power reduced by unemployment. The immediate sources of his merchandise—jobbers, wholesalers, manufacturers—are but one degree removed from the initial onslaught of a business depression and so are quick to feel its strictures. Just behind the maker of such consumer goods stands the manufacturer of the machinery with which they are made, and in turn dependent upon his orders for new units and repair parts is the producers of the metals, nonmetallic minerals and other raw materials that enter into the manufacture of those machines and into the construction of the factories in which they are made. The last depression illustrated more clearly than any previous one how quickly the depressing effects of unemployment pass from the point of first attack on the retail field to industry's back-line defenses, the producers of raw materials. Yet most of the latter, most manufacturers of capital goods, still seem to find nothing of interest to them, no problem worthy of their discussion and attempted solution, in the continued prevalence of unemployment or in the apparent certainty that unless some remedy is found its ravaging effects will make business enterprise of all kinds even less secure in the future than it has been in the past. Profits can not be as large, as continuous, as certain as they should be if the cancer of unemployment with its inevitably resultant emaciated purchasing power continue to sap the strength and gnaw at the vital organs of our economic system.

AND there are even more ominous aspects of the unemployment problem than those just mentioned, for they merely impair the rate, the continuity and the certainty of business profit. The social dangers are far more to be feared, for they threaten the security of all social institutions, economic organization—the very theory of business enterprise—as well as political organization. No one can measure or even approximately estimate the suffering and misery that fall upon the unemployed worker and his family under prolonged unemployment. Even though emergency support from private or public sources may be available after their savings have been depleted and in sufficient amount to prevent starvation, some families are forcibly broken up while others disintegrate. Thousands of children find their way into public institutions, while many of those who remain at home are undernourished and permanently weakened for the coming struggle for existence. The last depression showed us on a huge scale the impairment of public health due to unemployment and the demoralizing effects on hundreds of thousands of youths of the inability to find proper living conditions at home or to become self-supporting away from home. Orderly existence, the kind on which every stable civilization must rest, becomes impossible, and aimless living, without either opportunity or responsibility, becomes so habitual that a return to a regularly scheduled life, even when made possible by the return of prosperity, becomes temperamentally impossible because of the destruction of systematic traits and the loss of all sense of social duty.

THE inability to practice his trade which results from prolonged unemployment reduces the worker's ability to find remunerative work, even when this becomes available, because the highest types of skill degenerate into awkwardness through continued lack of use. The inability of most capital-goods manufacturers to re-engage skilled mechanics in recent years was one of the most striking examples of the great loss in society's stock of technical skill that follows continued unemployment. All these discouraging factors contribute to the building up in the unemployed worker's mind of a bitterness and resentment against the society that allows such conditions to exist. No spiritually healthy human being can long experience the hardship and misery of a bare and uncertain existence without questioning the wisdom and the fairness of social arrangements that destine large sections of the population who are ready and willing to work to physical and moral disintegration. The disillusionment and despair which these conditions engender are fertile soil for the planting of social-revolutionary ideas, and wherever unemployment continues long and on a large scale there is reason to be fearful of a violent disruption of existing economic and political organization.

This is the ugliest aspect of unemployment and the one that calls for the most sincere, intelligent and sympathetic approach. It carries the greatest threat to social peace and order, because it feeds on a growing sence of injustice and futility that feels no respect for established institutions. It should hardly need to be said that it is no repector of personal position or property rights, as recent events have amply shown. The problem of unemployment and the conditions it creates call for continued study by our best minds in business and outside it.

A FLOATING GRAVEL PLANT IN ILLINOIS

General view of operations of the Kingston Lake Gravel Co., Lacon, Ill.

THE Kingston Lake Gravel Co. has for many years operated a sand-and-gravel plant at Mapleton, Ill., to supply Peoria and the surrounding territory. This plant is thoroughly modern in every way, having been almost entirely rebuilt a few years ago.

In 1936 the company secured a contract to supply aggregates for the construction of locks on the Illinois River 5 mi. downstream from, and south of, Peoria. Because water shipment was necessary and because of other provisions in the contract specifying the manner in which this material was to be produced, it was decided to build a floating portable plant to supply this demand. The first contract for this lock was for 120,000 tons of sand and gravel. Later a 176,000-ton contract was obtained for a lock and dam at La Grange, 8 mi. downstream from Beardstown, Ill. Later contracts for a dam at the Peoria lock and for seawalls and other similar work may also be supplied from this plant. All this work is part of the program to insure a 9-ft. channel in the Illinois River after diversion of water from Lake Michigan ceases December 31, 1938.

Early in 1937 it was decided to operate this plant permanently and a yard was opened in East Peoria to supply the local demand. Facilities for making railway shipments have also been installed there. The plant has a capacity of over 125 tons per hr. and during a large part of the summer was operated two 8-hr. shifts daily to meet the demand for material for the government projects, which sometimes reached 15,000 tons per week.

The site selected for this plant is at Lacon, Ill., on the east side of the Illinois River, 35 mi. north of Peoria. The 160-acre deposit was leased on a royalty basis. The overburden averages less than 2 ft. in depth and is removed by a contractor. The material in the deposit averages about 65 per cent. gravel, about two-thirds of which is from ¼-in. to 1-in. in size. About 25 ft. of the deposit is above the normal river-level and dredging is being carried to a depth of 30 ft. The dredge pond was cut back from the river bank in such a way that the dredge operates in still water and the plant has access to the river at all times for barge shipments. Floods do not hinder operations but low water does. When the Peoria dam is completed, a more even river stage is expected.

The hydraulic dredge supplying the floating plant was formerly used at the Mapleton plant. It has a steel hull 30 ft. wide and 90 ft. long with 16-ft. extensions to support the intake nozzle and the Amsco revolving cutter head. A monitor is used to help break down the bank of material above the water-level. Water for this jet is supplied at high pressure by a 5-stage centrifugal pump. The ladder and the four land lines are operated from a 5-drum hoist. The 15-in. Amsco manganese-steel dredge pump is driven by a 400-hp. electric motor. U. S. Rubber Co. Giant dredge sleeves and flexible couplings are used on the dredge and the pipe-line.

The material is pumped through a 15-in. pipe-line supported on pontoons, which also carry the power cable. As the dredge cuts into the deposit this pipe-line is gradually extended to a length of about 1,000 ft. The floating plant is then moved up

The dredge and pipe-line as seen from the plant. Part of the sand-settling flume is in the foreground.

to within 100 ft. of the dredge and is anchored there. This process will be repeated about once each operating season. This comparatively short pumping distance makes it possible to get the maximum output from the dredge and also reduces the power costs and pipe wear. Moving the floating plant also takes it away from the piles of extremely fine waste material which accumulate about it and provides fresh space for its disposal.

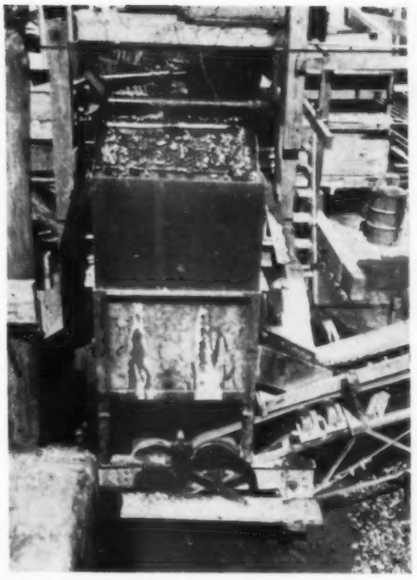
The water and material are discharged from the dredge pipe-line into a surge box on the floating plant. Some of the water and fine sand overflow into a flume, the remainder of the water and material flows on a 5-ft. by 12-ft. Robins Gyrex double-deck screen. Wire cloth with 1-in. openings is used on the top deck and the bottom deck has 8 ft. of ¼-in. cloth and 4 ft. of ½-in. cloth. All the material passing through the bottom deck flows with the water into the flume previously mentioned. This steel flume is 4 ft. wide and has sides 30 in. high. It makes a 180-deg. turn, beyond which are 8 settling tanks which remove the sand. The water and excess fine sand flow on to be wasted in the dredge pond.

The 8-in. dredge pump which forces the excess of fine material to the waste pile.

The dewatered sand is discharged from these tanks on a 24-in. by 110-ft. belt-conveyor operating on a slight incline. This conveyor discharges it on a 100-ft. belt-conveyor supported by wooden trusses on temporary wooden piling. Plows at various points on this conveyor make it possible to discharge the sand evenly into a barge at the end of the plant without moving the barge.

The ½-in. to 1-in. gravel retained on the bottom deck of the Robins screen is discharged on a 24-in. by 100-ft. belt-conveyor, from which it falls on a 3-ft. by 6-ft. Niagara screen equipped with ¼-in. wire cloth. Sprays rewash the fine gravel on this screen, after which it is discharged on a short inclined cross belt-conveyor from which it falls into a barge.

The material over 1 in. in size retained on the top deck of the Robins screen is discharged into a 6-ft. by 16-ft. revolving screen which serves as a scalper. This screen has 2-in. perforations on its main barrel and has a 12-ft. jacket with ¼-in. wire cloth. The 2-in. plus gravel is discharged from this screen on a 32-in. by 50-ft. belt-conveyor on which soft rock can be picked out, when this is necessary.



Double-deck vibrating screen which discharges two sizes of gravel on the barge-loading conveyor below.

The coarse gravel is discharged from this conveyor into a 6-in. Allis-Chalmers gyratory crusher which reduces it to 2-in. and under. A belt-conveyor returns the crushed gravel to the revolving screen for rewashing and resizing. Any crushed gravel passing through the ¼-in. outer jacket goes to waste.

The material retained on the outer jacket of the revolving screen (¼-in. to 2-in.) is discharged on a 24-in. by 75-ft. belt-conveyor. This carries it to a 4-ft. by 8-ft. Simplicity double-deck vibrating screen with 1-in. cloth on the top deck and ¼-in. cloth on the bottom deck. The fine rock retained on the bottom deck of this screen is discharged into one side of a steel rock box which feeds it to the fine-gravel barge-loading conveyor already described. The coarse material

A clam-shell derrick boat keeps the channel to the river cleared for barges and tugboats.

retained on the Simplicity screen is discharged into the other side of the rock box, which feeds a conveyor for loading barges on the opposite side of the plant.

A small dredge with an 8-in. pump is used to move some of the waste material from this plant to a pile a few hundred feet away. Some of this material has been loaded into trucks for certain types of road work. A steam derrick boat handling a clam-shell bucket keeps a channel open to the river for the barges

The floating plant is supported on four 50-ft. by 20-ft. sections of what was once a floating dry-dock. These sections are rigidly fastened together

The floating plant viewed from the end of the sand-barge loading conveyor.

to form a single hull by 12-in. by 24-in. timbers bolted into place. These four sections are spaced for the best load distribution, forming a hull having ample buoyancy and enough width for stability. Wash water is supplied by a 2-stage, 1,000-g.p.m. centrifugal pump and two smaller pumps.

The belt-conveyor idlers and pulleys in this plant were supplied by the Robins Conveying Belt Co.

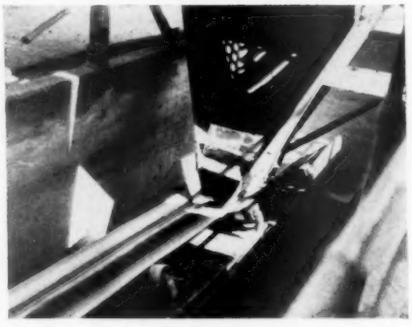
Double-deck screen and surge box. Sand-settling flume at left.

Another view on board the plant. Sand tanks and conveyor at left. Conveyor at right feeds oversize gravel to crusher.

Two 150-hp. towboats, one steam- and one Diesel-powered, tow the ten 400-ton steel barges used to haul material to the Peoria lock and to the company's retail yard in Peoria. This 80-mi. round trip is made in 16-hr. Four or five barges are towed at one time. Six of these barges were built in 1936 by the St. Louis Shipbuilding Co. These barges and boats are owned by the Kingston Lake Gravel Co.

The contractor on the La Grange lock has 4 towboats and 25 barges which haul all the material for this job. This is a 110-mi. haul one way.

MAKING CONVEYOR, ELEVATOR BELTS LAST



In the left-hand photograph the crusher discharge falls on the belt directly over the tail pulley. The belt is pounded by rocks as it would be between a hammer and an anvil. There is no chance for the belt to give and the rubber cover has been badly gouged and cut. The effect is almost as bad if the chute discharges directly over idler pulleys. The chute location in the right-hand photograph is better, the discharge being about 18 in. back of the idlers. The tail pulley is also far enough back to allow the insertion of a set of idlers back of the chute to steady the belt and reduce vibration and chattering.

LEFT—It was estimated that this set of bar baffles or "jingle bars" saved the operator more than $1,000 per year. They are suspended from the top to swing free at the bottom. A cable is threaded through all the bars a few inches from the top serving the dual purpose of increasing the shock resistance and preventing any single bar, which might be torn loose, from dropping on the belt and being carried along to wreck a secondary crusher.The material striking the bars loses its velocity and slides on the belt. The weight and number of such bars has to be carefully adjusted to avoid slowing up the feed too much and thereby choking the chute. RIGHT—In spite of every care, it is impossible to keep loose material from getting between elevator belts and boot pulleys. The squirrel-cage type of pulley allows material to clear instead of being ground into the surface of the belt. (Courtesy B. F. Goodrich Co.)

LABOR RELATIONS IN INDUSTRY*

By EDWARD F. McGRADY
Assistant Secretary of Labor
Washington, D. C.

WE DO not know, as yet, the full intendment of the Supreme Court decision on the Wagner labor act. Before this decision most lawyers thought that the court construed the constitution to prohibit Federal regulation of labor relations on the ground that it infringed the due-process clause of the 14th amendment. This created the famous "no-man's land" between the power of the state and the power of the nation in which no governmental authority could by statute regulate many of the most important relations between employer and employee.

Precisely how much these two far-reaching decisions may have changed all that, we do not know. But that they have changed it importantly all legal authorities seem to agree. If you admit the broad principles stated in these two cases, it is not easy to doubt that they have given us a completely new basis for the relationship between labor and management under supervision of government. "No-man's land" is completely occupied.

Labor is principally interested in two aspects of this problem. First, it regards the right of collective bargaining through representatives of its own choosing independent of employer influence as absolutely necessary in this modern age. Secondly, it believes that there should be some floor under labor relations which will protect labor against sudden and destructive downswings in wages and lengthening of hours to the unemployment and distress of millions, such as were witnessed during the depression. These two aims seem now within the range of accomplishment.

Labor believes that collective bargaining is necessary because it thinks that under modern conditions in industry there must be either collective bargaining or no bargaining at all. The rapidity and the volume of concentration of American industry into great corporate groups that have gone on in this century have been astonishing. I know the difference of opinion over the precise figures which show the tremendous percentages of business in various economic fields that are controlled by a very few large corporations. It is unnecessary to enter that debate. It is enough to say that we all well know that the old era, in which every employer was in personal contact with his workers, knew their problems, and actually did bargain with them for their services, is completely gone. We know that the owners of these great corporate units—the stockholders—have no contact whatever with their tens of thousands and hundreds of thousands of workers. We know that each one of these employers is itself a vast collectivism. We know that the managements of them are representatives chosen freely by these collectivisms and that on the employer's side we do have collective bargaining conducted by representatives of the employer's own choosing. Common sense would seem to say that if there is to be any mutuality in this relationship, labor also must move as a collectivism and must bargain through its own chosen representatives, just as the employer does.

Against this view some great employers have insisted, at least until recently, that they will never negotiate with representatives of their men, or in any way except individually—"man to man". In view of the facts which I have related and which you know as well as I do—and as every informed person does—the idea that there is any such thing as individual bargaining in modern industrial circumstances is just not true.

Unless labor, grouped collectively, can have its expert representatives wholly independent of employer influence, speak for it with a powerful voice, there is no real bargaining at all and wage rates are only an arbitrary decree of a more-or-less beneficent despotism fixing the conditions of labor in its own untrammelled discretion.

It won't do. I know you recognize that it won't do. The whole world recognizes it. The principles I have discussed have been adopted in every important industrial nation and put in practice to a far greater extent than they have ever been practiced here. Yet we have progressed far since the days in the early part of this century when it was a crime for workers even to meet in their own interest or to take any collective action whatever. These conditions and the public opinion attending them have changed because the whole circumstance of our economic life has changed. Collective bargaining has become such an obvious necessity to human justice in this modern world of vast industrial collectivism that any general denial of it here could not have gone on much longer without explosive and very dangerous results.

It has been a long time since I have heard any very clear denial of the principles I have just stated. Most economists, publicists and, farsighted industrialists that I know have advanced these principles in more or less different words, but to practically the same effect. If there were any question about that, I could recall to your memory the fact that when the President in 1933 asked employers voluntarily to agree with him on a labor policy in the so-called P. R. A. (President's Reemployment Agreement), by actual census count 97½ per cent. of the employers of this country signed that agreement. It contained a specific pledge to permit to labor the right of collective bargaining through representatives of its own choosing, selected without employer influence or domination of any kind.

You and I know that these great changes from ancient methods of thought and practice do not come so easily in our hearts. We all dedicated ourselves to this principle in the letter four years ago, but it is the letter that killeth. It is the spirit that giveth light. I do not wish to appear harsh in judgment, but the cold, historical fact is that the four years since the promise was made were largely spent

This article is extremely interesting and timely. It points out not only the purposes and aims of the various labor groups but the attitude of the goverment in this regard.—Editor.

*Presented at the 1937 Annual Meeting of the Chamber of Commerce of the United States, Washington, D. C.

by some employers in efforts to frustrate, avoid, nullify or escape fulfillment of the spirit of that pledge. I am not saying that many of these attempts were not sincerely believed by those who made them to be in substantial compliance with the statute that had been written and with the promise that had been passed. There were too much legalism and too many lawyers in the advice that some received.

I know, too, that the device of the company union spread like wildfire over this country that it might be accepted as compliance with the provisions of Par. 7a of the National Industrial Recovery Act, and many honest men believed that. But I also know that in practice, in almost every case, the company union did not give labor the independent collective and representative voice that it must have to meet the necessities adequately. By "company union" I mean a union confined to a single company, more or less supported by management, and, above all, offering as representatives for labor only employees of that company.

As long as the so-called representatives of labor for the purpose of collective bargaining also maintain the relations of employee to the employer labor can not expect to be represented fearlessly. Fear of the "boss" and apprehension of the job are an indelible intangible that ruins true representation. There is something of the old "master - and - servant" relationship that does not easily down. It has been fairly tried and it doesn't work.

We have wasted four years running up these blind alleys. Sec. 7a went out with no particular condemnation by the court; it just fell in the general ruin of the Schechter case. That left the whole matter in such a shadow of judicial doubt that I don't blame any employer for uncertainty as to what his duty under the law might be, or as to what attitude he should take on this vexed question. But that is all water over the dam. We are no longer under the shadow of that doubt. It is now very clear at least that employees of a company in circumstances where their labor relations within one state "affect or concern" other states, *do* have the right of collective bargaining and of independent representation, and that the Federal government is empowered to enforce that right.

On that assumption I beg to discuss this subject. The attitudes already taken by some of our greatest industrial leaders seem to make it clear that, on both sides, we are now ready to face the new day seeing eye-to-eye on this question. The greatest mistake that I believe any employer could make is again to call in the lawyers and attempt to try to frustrate, avoid or nullify this right. I have no doubt that no such thought is in the minds of the responsible representatives of our industrialists gathered here.

We are all industrialists—labor as well as management. It is nonsense to suppose that labor has not as much interest in the success of our joint enterprise in every one of these great corporations as have the management, the directorate, or the stockholders. The task for us who are partners in this economic adventure is to sit down together across the table, to look the circumstances of this real New Deal for labor in the face in common council, with proper restraints and unfailing courtesy, to work out an adaptation and a solution which, while rendering the greatest possible benefit to each, will do the least possible harm to any.

That can be done. It can be done without acrimony, violence, unfairness, improper advantage or any of the little tricks that each side in any ancient hostility seemed to expect in any encounter with the other. We can adjourn all that and play the game in the honesty of purpose and good sportsmanship that we like to think have distinguished American relations from the beginning of our history.

As a starter, let me say frankly that I know many of you gentlemen are impressed with a belief that the Wagner labor act is unfair to industry because while it creates duties and obligations on the part of management it creates no rights on their part, and while it creates so many rights for labor, it seems to create no duties and obligations for labor.

Let us not forget that at the time the Wagner act was written the attitude of at least some management, as to the particular subjects it addressed, seemed to be that, while there were plenty of duties on the part of labor, and rights on the part of management, the reverse of that did not exist. In other words, the Wagner act invaded a field so one-sided in its practical application that its principal concern was to strike a new balance and rectify a condition unfair on the other side. Perhaps this whole background has now been changed, but in these great fundamental changes we must remember that Rome wasn't built in a day.

There has been no real experience with the Wagner act and that, permit me to say, was not the fault of labor. It was the fault of some of management and the lower courts. In almost every conceivable circumstance the lawyers moved in on that law with a result that the ink on it was scarcely dry before the National Labor Relations Board was paralyzed by injunction on practically every front. It remained paralyzed until by the recent decision of the Supreme Court in the Jones & Laughlin, Associated Press and other related cases it was restored to the potency with which the Congress had baptized it. Let's get a little experience with the new dispensation before we begin to write new laws.

The essence of successful labor relations is an unvarying respect for the sanctity of contracts. Labor knows that it can expect no countenance in public opinion unless it respects its contracts, and it knows further that without the respect of public opinion it can not live.

Before a decision is reached by management to demand the incorporation of labor units, and statutory fixation of pains and penalties, it might be well to examine the record of labor relations in some of the older and better established units; for example, the relations in the bituminous-coal industry, the garment industry, and the printing trades. You will find there stability, respect for contracts and comparative peace.

It happens now that the veil of the temple of labor is rent asunder by fratricidal strife, but if you will examine the records of the principal leaders on both sides of that unfortunate rift you will find, I think, an invariable history of absolute adherence to the pledged word.

When new unions are formed with such rapidity as we have witnessed in the past few months, it is inevitable —especially when they feel that the law of the land is being violated on the other side—that new and inexperienced leaders will permit themselves hasty action.

Growing responsibility is the greatest disciplinarian of new labor leaders and when overhead control is so closely held by such experienced, responsible and dependable men as William Green on the one side, and John L. Lewis on the other, I think it would be the part of wisdom patiently to rely a little on that leadership for at least a reasonable period of seasoning and experience.

I do not for a moment condone or contend for any irresponsibility on the part of labor, but I do not jump from that principle to the immediate conclusion that some new statutory action is the way to complete responsibility. God knows that these leaders have a responsibility far heavier than

any law could lay upon them. They have the responsibility for the life and limb, for the peace and welfare, of their constituents. They have also, and I know they feel deeply, the responsibility of any American in a powerful position, whether in or out of government, for the peace and welfare of the people of the United States.

As John Lewis is reported to have said to a friend: "Sure, some of our new leaders are inexperienced, but is the answer of industry that because they are inexperienced they are never going to be allowed a chance to get experience? Is labor to be forestalled forever because it has no chance to practice these relations? If the government in an emergency had to raise an army of several million men, would you expect all the non-commissioned officers to be capable on the day after their enlistment?"

It will be pretty hard to find an answer to that intensely practical argument.

I can assure you of one thing. Labor approaches its new power with a due sense of its obligations. Labor does not seek trouble. You won't get arbitrary attitudes, unreasonableness, violence or hostility from labor, except in the measure that you mete it out. I know from personal contact. These men respect and admire you too much to start in that atmosphere and frame of mind.

If we can now just get rid of all old standoffishness — the old throwback to the medieval concept of the master-and-servant relation—to the sense of partnership in a common purpose and on equal terms, you won't find your friends in labor at the conference table one bit more hard-boiled, one bit more voracious in bargaining, than you know your own selves to be when you sit down with either your supplier or your customer to trade out an ordinary business proposition in the ordinary peaceful struggle of competition.

I started out as an apprentice mechanic. I went forward through all the grades of foreman, superintendent, manager—top sergeant stuff to the captain of industry. I went from that to officer in a labor organization, finally to be a contact man for many years between labor and the Congress. Latterly, as a representative of government, I have been called in many times in some of the fiercest industrial disputes this country has known recently. In that process I came to know all the great labor leaders, and it was my privilege also to become what I flatter myself is a confidant and friend of some of the greatest industrial leaders in this country, which is to say, the greatest industrial and labor leaders in the whole world.

I mention this little history merely to remark that from that rather full experience I conclude that there is no great difference between the humanity, the goodfellowship, the reasonableness and the sense of public and personal responsibility of the leaders on both sides of this argument, which, in my opinion, should be no argument at all.

The principal trouble is that they don't know each other well enough. In the early days in N. R. A. we almost accomplished the miracle of breaking down these barriers. I think one of the greatest mistakes of N. R. A. was that, after about six months of close contact between the Labor and Industrial Boards, most of the leaders of the original industrial board were "rotated out". It is true that men of equal caliber came in, but they had to be educated all over again. In the meantime a great opportunity was lost.

Contact, fellowship, the opportunity to learn and weigh and appraise the other fellow's problems is the way to a solution of these difficulties.

The simple fact has been impressed upon me over and over again in my work in attempting to mediate disputes in several of these great national industries. There is a sort of hierarchy in the management of a great corporation. The local plant manager has responsibility to the general manager who is sometimes a thousand miles away. In these tremendous business organizations the local manager is in a form of competition with other plant managers. He is very far away—in distance and contact—from the authorities who finally decide the labor policies which are of the most vital importance to the people who work. If his cost sheets, by reason of some concessions to local conditions, show a rising tendency when those of other local managers do not, his very job may be in question. His own subordinates—foremen and superintendents—are not very eager bearers of bad tidings and if there are no other representatives of workers there is a tendency for him not to be informed of conditions developing under his hands which some day suddenly and sometimes to his complete surprise burst forth in an eruption, the end of which may be a loss of millions to both management and labor.

Now if in the new relationship we can work out some closer, warmer, more intimate contacts through this system of representation and collective bargaining many of the causes of friction, hostility and uncertainty can be stopped in their inception and the way is open to more peaceful days everywhere.

That can't be done by labor alone. It can't be done by management alone. It can be done only by the closest possible relationship accompanied by the utmost frankness from the top to the bottom.

I know that some of you approach this change with apprehension, but my studies and experience on the whole subject indicate a result which, I think, you will one day live to bless.

There are now rendered possible labor agreements covering whole industries and taking out of the field of competition, by the constituent companies in an industry, the whole question of labor costs. The possibilities of this change are very great. They are of such far-reaching public importance that I believe the original conception of N. R. A., in so far as it covered labor relations, will one day vindicate itself.

Advantages to both labor and management from this new partnership will prove so great that in its own protection the public also, through government, will some day have to have a seat at this partnership table—not to dictate, not to prohibit reasonable profit and improved labor conditions, but to protect the public from too great a use of the tremendous power of the new partnership.

I have been informed, I trust inaccurately, that in some industries there is a move to devise some way to restrict the spread of unionization in industry, to minimize the gain to labor in the Wagner act, and in the recent Supreme Court decisions. I hope, if such a thing is true, that you will use your great influence against it. Regardless of what you may think of other aspects of the New Deal, this march of labor to its minimum necessary objectives is the sweep of a great popular movement that covers the earth. You can no more stop it than Canute could have stopped the tides by his command, or attempted to sweep them back with a whiskbroom. No, it can't be stopped, but you can guide it, accommodate it to your needs and profit by it. My word to you in the most sympathetic, friendly and constructive counsel is not to try to stop it but to use it and make it successful.

With the full coöperation of industry and labor, each trying to understand the problems of the other, we can work out our own destiny in our own way. All of us, industry, labor and the general public, will profit by such a program.

WPA Completes Broad Survey of Mineral Resources in Oklahoma

DETAILED information concerning mineral deposits in Oklahoma is now available as the result of a statewide mineral survey, started in 1935 as a project of the Works Progress Administration and finished at the end of 1936 except for the completion of laboratory analyses on samples already taken. Each of the state's 120 counties has been investigated by the field workers for the survey, exact maps have been made, gathered data have been summarized and the results published in a *Report of Operations and Accomplishments of the Oklahoma Statewide Mineral Survey Project.*

There are no platinum, gold or silver deposits in the state; not even copper, the report sets out. But the state has a vast store of deposits of the baser minerals and the Oklahoma Geological Survey knows exactly where they are and in what quantities.

Here are the state's mineral resources as estimated in the report:

Sand	167,739,158 cu.yd.
Gravel	263,196,149 cu.yd.
Miscellaneous stone for roads (other than limestone)	869,172,990 cu.yd.
Construction stone (other than limestone)	916,300,713 cu.yd.
Limestone	5,271,367,739 cu.yd.
Asphalt	26,131,316 cu.yd.
Caliche	10,336,956 cu.yd.
Coal	18,143,250 cu.yd.
Gypsum	701,579,908 cu.yd.
Volcanic ash	4,000,000 cu.yd.
Wool rock	727,455,815 cu.yd.
Clay and shale	2,229,291,819 cu.yd.
Tripoli	6,489,000 cu.yd.
Bentonite	2,347,111 cu.yd.

These estimates are available by counties and the smaller units of land measurement at the office of the survey, which, the report emphasizes, will be glad to give prompt answer to pertinent inquiries.

Assembly of the material for the survey was begun in July, 1935, under the direction of the Oklahoma Geological Survey, with a staff of more than 600 persons supplied by the W.P.A. Hundreds of occurrences were discovered and prospected and mapped, and about 10,000 samples of such economic minerals as building stone, volcanic ash, clay shales, and materials suitable for the manufacture of quicklime, cement, rock wool, and other commercial products were taken.

At the time of the report about 5,000 of the samples had been chemically analyzed and physical tests were being made as fast as needed equipment could be installed. The capacity of the survey's laboratories was more than doubled to care for the great amount of material assembled.

In addition to collecting these data, the project workers made a careful study of the state's water supply, during which the culture was carefully plotted on large field sheets. From these data county maps are being prepared which show the location of all houses, roads, public buildings, towns, railroads, etc.

The work of the survey was divided into three general headings: Culture and Water Resources, Road and Construction Materials, and Miscellaneous Minerals. A record was kept of all field investigations on special field sheet forms and each county headquarters compiled on three base maps, one for each of the branches, all the information gathered in the field. Field sheets and samples of materials were sent from the county offices to the district offices, where screen analyses were made of all sand and gravel samples. Finally, all field sheets, data sheets and samples of materials other than sand and gravel were forwarded by trucks to the state headquarters at Norman.

In the Cultural and Water Resources Division base maps previously prepared by state and county departments and by private mapping companies were used as starting points, and errors, as found, were corrected. Boundaries of cities and towns were checked and in some cases corrected from court-house records. Highways, railroads, cemeteries, school houses, rural stores and such details as important stream crossings and other landmarks were measured in by pacing and speedometer readings to the nearest section corners. Drainage was sketched as accurately as technique permitted. In rugged and remote areas, with few section-line roads, the work was found more difficult, and though the results were proportionately less satisfactory they were far better than anything that had existed.

The objective of the Road and Construction Materials Division of the survey was to locate deposits, prospect them as to depth, overburden and thickness, and to map the results on field plats. Careful notation was made with regard to the possibility of the use of material from each of the deposits in either road or building construction. This resulted in considerable savings in the cost of materials on a number of W.P.A. projects and the consequent devotion of the savings to the employment of labor.

It was found that caliche, which is similar in chemical and physical properties to limestone, makes a durable road base when crushed, packing to a hard, smooth and not especially dusty surface which is sufficiently durable to withstand light traffic. This material, because of its white color, was recommended as a covering for airport landing fields.

Experiments showed that the material tripoli, a light homogeneous rock which crushes readily, when mixed with clay packs to a hard, resistant roadbed that requires little maintenance. Its use for road construction was recommended in the four counties in which it is found.

Salt, of which there is an abundance in a free state in some places in the state, was made the subject of experiments for road-building purposes. One experimental section in Beckham County had been serving well under heavy traffic at the time of the publication of the report.

Asphalt was found in three types: native rock asphalt, native liquid asphalt and refinery asphalt made of certain types of crude oil. All known deposits were examined and many new ones discovered. Summaries of the information with regard to them were made available to construction companies and to the departments receiving bids on highway improvement with the result that, at the time of the report, there was a good prospect of commercial exploitation of some of the more available deposits.

Many samples were taken of the abundant limestone deposits in the state and the results of analyses made available to manufacturers of cement, rock wool and builders' lime. The use of certain types of crushed limestone in road construction was recommended.

The report concludes that the cost of the survey, about $500,000, of which $80,000 was contributed by the state, has already been repaid in savings for haulage and cost of materials, and adds that its future benefits will run into many millions of dollars. This, of course, is in addition to the relief employment provided by the survey.

Metallic Aluminum . . . a Possible Key to the Prevention of Silicosis*

Most research toward the prevention of silicosis has been directed toward removal of the harmful dust particles from the atmosphere. This article tells briefly how the problem is being attacked from another angle—by the addition of a small percentage of metallic aluminum dust which tends to render the composite dust relatively harmless to respiratory tissues.—EDITOR.

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As a result of an investigation of silicosis undertaken at the McIntyre Porcupine Mine, Schumacher, Ont., in 1932, it was decided to carry on dusting experiments with animals at the mine in a manner that would duplicate as far as possible actual industrial conditions.

At that time 50 guinea pigs were placed in the crusher-house tunnel of the mill where a considerable quantity of fine dust, containing approximately 35 per cent. of free silica, was being constantly produced. These animals lived in this atmosphere for periods up to one year, and, while on autopsy large amounts of dust were found in the lungs, not a single case of silicosis had developed.

These negative results suggested, among other things, that the mine gases might be a predisposing factor in the production of silicosis, and the results of this investigation led us to undertake the study of the hydrogen-ion concentration of the condensate of the atmosphere, both in the mine and in various sections of the mill. The CO_2 combining power of blood serum on a series of 400 miners was also studied at this time. While these results were inconclusive, the variation in the hydrogen-ion concentration of the condensate between the surface and underground atmospheres encouraged us to investigate the effect of neutral, weak acid and alkaline solutions on the solubility of silicious materials.

Earlier investigation had shown that the chemical reaction and not the physical presence of siliceous material was responsible for the production of the fibrosis in silicosis and that the tissue reaction to quartz was definitely proportional to the size of the particle. Other research had proved that 1 to 3 micron particles of quartz produced an acute proliferative fibrotic response, while the 10 to 12 micron particles produced only a foreign body reaction up to a period of three years. It is accepted that the dangerous silica particles retained by the lung are under 5 microns in diameter. We assumed that if the solubility of the siliceous material retained in the lung could be reduced sufficiently by the addition of some non-toxic element or compound the usual fibrotic response would be modified. We found that the addition of certain compounds to silica would reduce its solubility in the beaker to a slight extent. But these compounds, when mixed with quartz, injected subcutaneously or inhaled, did not lessen or actually increased the tissue response produced by quartz alone. Some of these compounds were found to be toxic.

Various elements and compounds were then investigated, and on March 4, 1936, we discovered at the McIntyre Mine, that the presence of small amounts of metallic aluminum almost completely prevented siliceous material from passing into solution. This discovery was made after investigating P. Heffernan's theory, which was based on the work of W. Bragg. Heffernan suggests that silica is active when freshly fractured because of its molecular structure, which presents numerous unsatisfied oxygen atoms to interact with tissue elements. This suggested to us that if the unsatisfied oxygen atoms could be satisfied with nascent hydrogen it might diminish the toxicity of silica in tissue and change a fibrotic response into a simple foreign body reaction.

Animal experimentation was commenced on June 10, 1936, dusting a group of rabbits with mine quartz, to which small quantities of metallic aluminum had been added. In this experiment 13 rabbits were dusted in specially constructed chambers. Six control animals were dusted with quartz alone, while 7 were dusted with quartz containing less than 1 per cent. of metallic aluminum.

At various intervals up to six months, the lungs and other organs of the animals were sent to us for pathological examination. Upon sectioning, it was found that all the controls showed a picture varying from early to well-established silicosis, depending on the length of exposure. The animals subjected to silica dust containing metallic aluminum all showed either minimal or no fibrosis of the lungs. No damage was seen in the lungs or other organs that could be attributed to the presence of aluminum. These results showed that silicosis was inhibited in this small group of rabbits by the admixture of *less than* 1 *per cent.* of metallic aluminum to the quartz dust.

Dusting experiments similar to the one described above are being carried on at the present time, using larger groups of animals. From this group, following 3½ months of dusting, the lungs of one quartz-control and two quartz- and-aluminum-dusted animals were sectioned. The lungs of the control animal showed beginning silicosis, while the two animals dusted with quartz and 1 per cent. aluminum *showed no evidence of any fibrosis!*

Many compounds of aluminum were investigated and found to be less satisfactory than the metal, since, being unstable, they gave erratic results. It took larger quantities to produce the same effect and in some cases certain compounds proved toxic to animals.

Metallic aluminum (specific gravity 2.68), having a specific gravity about the same as quartz (specific gravity 2.66), will naturally remain in suspension in a dusty atmosphere as long as the siliceous particles. We are of the opinion that the aluminum reacts as in the beaker when taken into the lung with the dangerous dusts; that is, that the rapid initial rise and concentration of the solution of the siliceous material is inhibited, thereby preventing degeneration of the dust cells and the production of fibrous tissue.

*An abstract of a preliminary report presented before the Academy of Medicine, Toronto, Ont., June 15, 1937 by J. J. Denny, metallurgical engineer; Dr. W. D. Robson, chief surgeon, McIntyre Mine; and D. A. Irwin, associate professor of medical research, University of Toronto.

A general view of the Hudson, N. Y., plant of the Universal-Atlas Cement Co. taken on August 30, 1937 showing the progress of construction up to that date. The grinding department is to the left of the storage building.

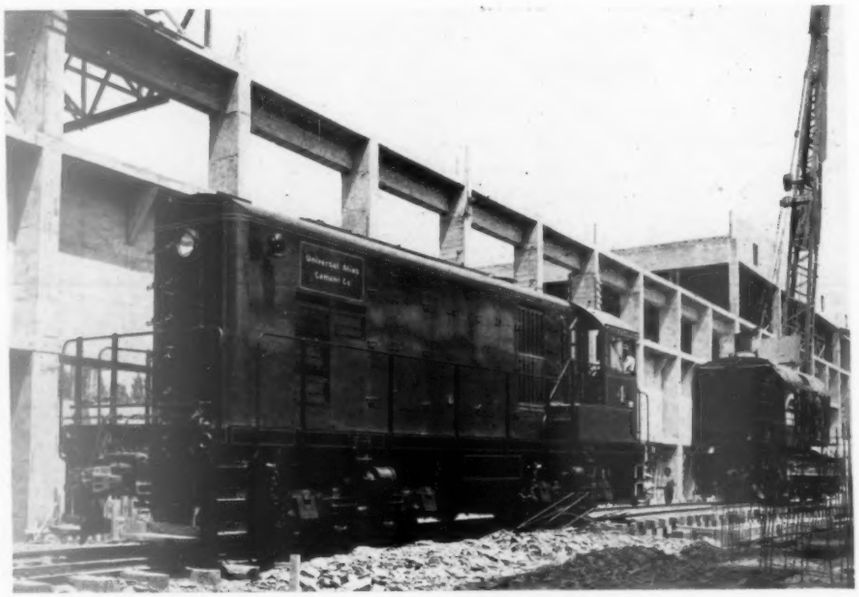
REBUILDING OF

IN 1936 the Universal Atlas Cement Co. announced an extensive improvement program to affect most of its nine cement plants. This work is now going on in several of the company's plants but is farthest advanced at the plant at Hudson, N. Y. This dry-process cement plant was built in 1909 by the Atlas Portland Cement Co., which was merged with the Universal Portland Cement Co. in 1930 to form the present company.

The Hudson plant is to be completely rebuilt over a period of several years and this work is to be done without any interruption of production. The program is so planned that each new department of the plant will be built while the old department it replaces continues in operation. After the new department is in operation the old department will be dismantled. The result will be a complete new plant at the end of this period. Only the cement-storage silos built in 1911 and 1932 will be retained. The kiln building will be the last to be rebuilt. After all the old operating departments have been dismantled and the equipment junked, new shops, warehouses, and a new pack-house will be built. The new plant will have a capacity of 7,200 bbl. daily, the same as that of the plant it replaces.

The first step in this program was the modernization and electrification of the quarry early in 1936. The old equipment was replaced by two electric shovels with 2½-cu. yd. dippers and Ward-Leonard control, a 9-in. electric well drill mounted on crawlers, and a 2-in. wagon drill.

The actual rebuilding of the plant



The new Diesel-electric locomotive which will do all the switching between the plant, the barge-loading terminal and the railway connections.

A view of the interior of the storage building under construction. In the foreground is one of the two overhead cranes which will handle raw materials, clinker and gypsum.

Station where bulk cement is unloaded from cars and pumped to barge-loading plant.

By W. E. TRAUFFER

HUDSON CEMENT PLANT NEARLY COMPLETE

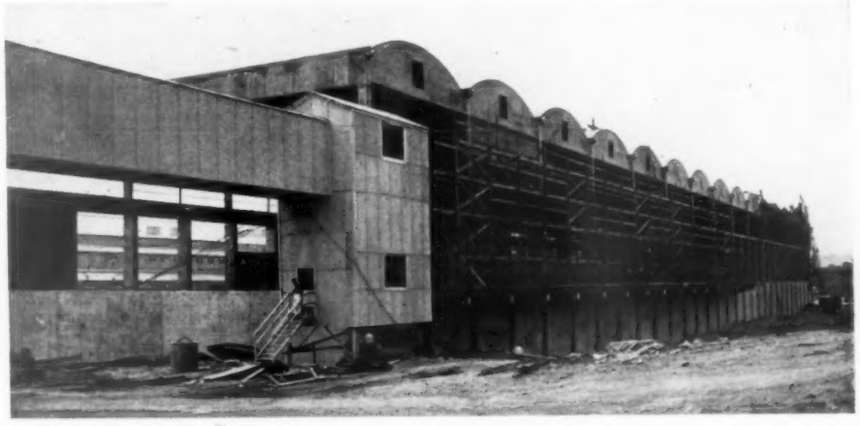
was begun late in 1936 with the erection of a new crushing plant and a belt-conveyor system connecting it to the storage building. This has been completed and the new storage building will be ready to receive stone by the time this article appears. The clinker-storage end of this building, the raw-material-grinding and clinker-grinding departments, and the dry-raw-material blending system will be completed in October. New direct-firing coal mills have already been installed on three kilns. A pneumatic system for transferring the cement from cars loaded at the plant to a stock-house and pack-house for boat shipments has also been completed. Near the end of the program three new kilns will be installed.

In the quarry stone is loaded into 12-cu. yd. Western side-dump cars which are hauled to the crushing building by steam locomotives for which Diesel locomotives may later be substituted. Cars run into this building by gravity and are "spotted" by a pneumatic retarder. A pneumatic dumper of original design dumps the rock into the 42-in. gyratory primary crusher, which will reduce the quarry-run stone to 6 in. and under at the rate of 600 tons per hr. The product of this crusher is discharged on a 25-ft. inclined pan-conveyor which drops it into the secondary crusher. This is a reversible hammer-mill which reduces the stone to ¾-in. minus. These crushers are driven by 300-hp. and 700-hp. motors, respectively. The use of a reversible motor on the hammer-mill makes it unnecessary to turn the hammers at intervals. Instead the direction of rotation is changed once a week. The stone has a free drop of 9 ft. into the hammer-mill so that some of the stone gets below the ends of the hammers, considerably enlarging the effective area of the hammer and reducing the wear.

The hammer-mill product falls on a 30-in. belt-conveyor which operates on 1,201-ft. centers and discharges it on a 98-ft. conveyor with a continuous recording scale. A 300-ft. belt-conveyor equipped with a tripper distributes the stone in the new storage building.

Constructed entirely of heavily-reinforced concrete, the storage building is 560 ft. long and 100 ft. wide and has a barrel roof of 105-ft. span. At present limestone, shale, gypsum and clinker will be stored in this building, which will hold about one month's supply of each. Later this building may be extended to provide coal-storage space.

A 15-ton overhead traveling crane with a 4-cu. yd. clam-shell bucket will transfer the stone and shale to the raw-mill feed bins. A similar crane serves the finish-grinding department. Stone and shale will be fed by continuous belt-type feeders into the



This view of the storage building near completion illustrates its modern design. At the left is the end of the long conveyor system from the crusher building.

Pan-conveyor which feeds the primary crusher product into the secondary hammermill.

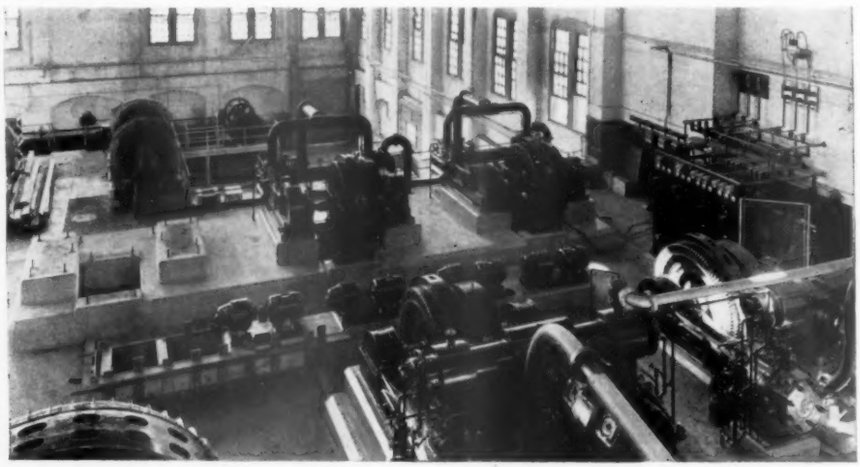
The loading station at the plant where cars are loaded with bulk cement while standing on a track scale. Scale house is at left.

The new crusher building with trestle from quarry at left. The conveyor system to plant is at right. Results of landscaping are already evident.

three Babcock & Wilcox No. 366 raw-material grinding mills. Each mill is air-swept by hot air from an oil furnace and this drying and grinding operation is controlled automatically by thermostats in the mills. In closed-circuit with each mill is a 16-ft. air-separator which returns the coarse material to the mill.

The dried and pulverized raw material will be discharged into six 5,000-bbl. concrete tanks which form part of the raw-material blending system. This is now under construction. These tanks are 30 ft. in diameter and 88 ft. high, and have cone-shaped bottoms to facilitate cleaning them out when changing from one type of cement to another. Rotary feeders with adjustable-speed drives will draw materials from these silos in the desired proportions for a perfect mix and will drop the blended material into a screw-conveyor feeding a pump, which will discharge it into two concrete tanks each 25 ft. in diameter and 72 ft. high. These tanks will be filled alternately and as each tank is filled its contents will be agitated by compressed air admitted through porous plates in the bottom. A dust-collector on the top of each tank will release the air.

The three direct-firing coal mills which serve the existing kilns.

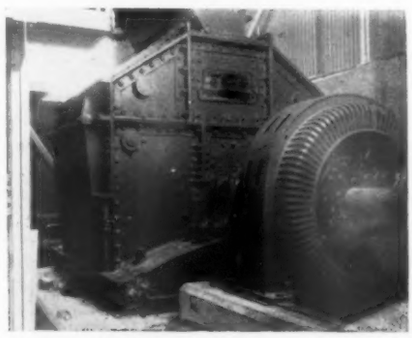


The compressor room in the power-house. In the background are two new compressors with space at the left for another.

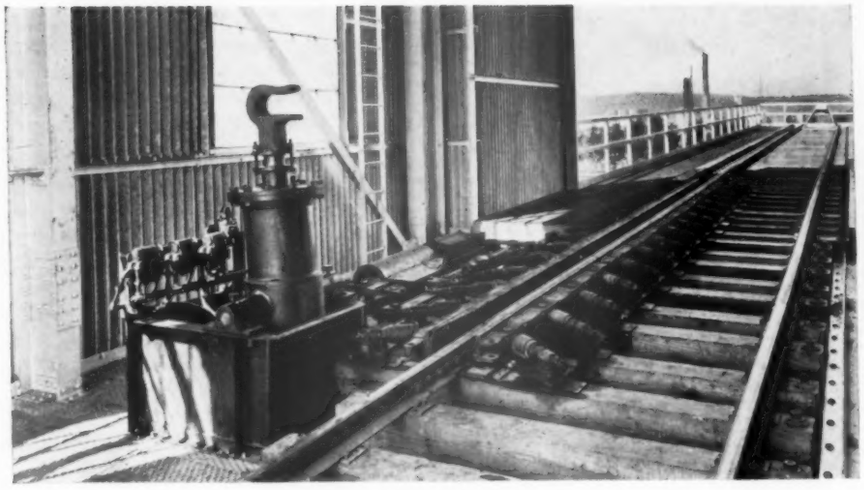
The two 6-ft. 5-in. by 175-ft. rotary kilns and the three 12-ft. by 233-ft. kilns are to be retained for the present. Coal for firing these kilns was formerly prepared in a separate building and was fed to the kilns by the bin system. The coal is being reclaimed from storage by a belt-conveyor fitted with a continuous scale. A new belt-conveyor discharges the coal into bins feeding the three new direct-firing mills connected to the three long kilns. Hot air for drying the coal and carrying it into the kilns is drawn from the cooler.

Clinker is discharged from these three kilns into primary rotary coolers which also preheat the combustion air for the kilns. The clinker is then passed through a second set of coolers which discharge it to elevators. These raise it to three automatic scales which discharge it on a belt-conveyor. At this point the new flow again begins. A new belt-conveyor will deliver the clinker to the new storage building.

The second overhead crane will take clinker and gypsum from storage and drop it in bins in the mill building. Two feeders, one under each bin, will proportion the clinker and gypsum, which will be discharged into a bucket-elevator. A double-deck screen, with the top deck merely protecting the fine-mesh wire cloth on the bottom deck, will scalp the coarse clinker, dropping it into a 10-in. gyratory reduction crusher, whose product will be discharged to the same elevator feeding the screen. The material passing through the screen will fall into a 10½-ft. by 12-ft. preliminary ball-mill, the product of which is to be elevated to four vibrating screens, whose oversize material will be returned to the ball-mill. The material passing through these screens will be discharged into three finish-mill feed tanks. Rotary feeders will discharge the material into one end of each of the three 8-ft. by 30-ft. compartment mills, whose two compartments are separated by solid steel plates. The product of the first compartments will be elevated to 16-ft. air-separators,



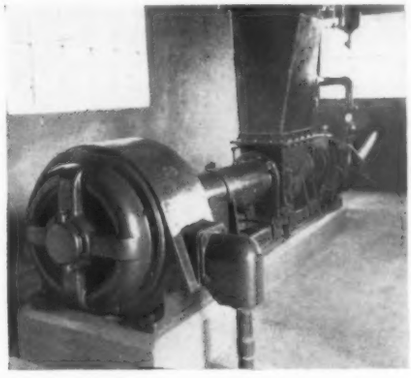
The reversible hammer-mill secondary crusher with reversible motor at right.



The track from which stone is dumped from quarry cars into primary crusher. At left are pneumatic car dumper and retarder.

The 42-in. gyratory primary crusher with its motor and V-belt drive.

the tailings from which will be returned to the first compartment while the fines will be fed by a screw-conveyor to the second mill compartment. The product of this compartment will be elevated to a second 16-ft. separator, the tailings from which will drop into the above-mentioned screw-conveyor, while the fine product will be finished cement. Some elevator-conveyors in this department will be of the drag-chain type. The finish-grinding department is expected to have a capacity of 500 bbl. per hr. when producing cement of 1,750 sq. cm. per g. specific surface area. Finer cement



The pump which transfers bulk cement from cars to barge-loading plants.

can be produced by adjusting the screens and separators.

This improvement program was developed by the engineering department of the company and is being carried out under its supervision. All the buildings are so designed that the capacities of any of the plant departments can readily be doubled and the new crusher building and conveyors have been designed to handle such an increase.

The company is sparing no expense in its effort to make this a thoroughly modern and efficient plant and equal attention is being paid to its appearance. All the buildings were designed with appearance as well as utility in mind, and where dust-proofing of the equipment is not possible dust-collectors are being installed. As various departments are completed the land around them will be landscaped and the completed project should be a thing of beauty. Already the crusher building has been so treated and this work is being carried on down the conveyor system to the plant. Wherever possible trees and other forms of vegetation have been left undisturbed and these form a part of this beautification program. Its location on U. S. Highway No. 9, the heavily-traveled main artery up the east side of the Hudson River from New York to Albany and the Adirondacks, should make this plant a show place for the industry.

GYPSUM DEVELOPMENT IN CANADA

At present two companies are producing gypsum in the Hamilton district of Ontario—a Canadian company established in 1905 and a subsidiary of an American company that began operations in 1931. Both companies have processing plants near the mines in the district. They also own mines and maintain plants in other parts of the country, which supply the demand in districts outside Ontario and provide exports. Virtually all the production in Ontario is consumed in the Province. The gypsum deposits in Ontario extend along the Niagara Peninsula and the Grand River, presumably the same vein that extends through New York state to Albany. Formerly the vein was mined by several small companies, which were finally consolidated and taken over by the Canadian company. Since the beginning of operations in 1931 the American subsidiary has acquired holdings aggregating about 450 acres.

The Canadian company produced about 90,000 tons of raw gypsum in the district in 1929, but since that time the annual production has averaged 20,000 to 25,000 tons per year, and 120 persons are employed. Production by the American subsidiary has averaged about 20,000 tons per year, and 60 persons are employed. Both companies operate on power supplied by the Hydro-Electric Power Commission of Ontario.

Raw gypsum sold to cement companies brings about $2 per ton, a price that apparently has not deviated very much over a period of years. Processing increases the value of the products, and gypsum rock processed to plaster brings about $10 per ton and about $18 per ton when processed to wallboard. Hence, the companies are giving considerable attention to producing various products from the raw gypsum.

Both operations worked steadily at about 65 per cent. capacity in 1935 and 1936. Production was highest in 1929 and lowest in 1933. Revival of building operations in the district is evidenced by increased demands for gypsum and gypsum products, and the companies are anticipating a further increase in production in the present year. At times the companies have to import certain products for use in mining and processing the gypsum, such as pumice, machinery, steel cutters, paper, and instruments for testing and measuring. Such requirements are supplied almost entirely by imports from the United States.

Proposes New Grading Specification for Sand

THE selection of specification requirements for grading of sand for national application, or even for state-wide application, always presents a tricky problem, the solution of which generally ends in a compromise. If limits are made narrow enough to insure desirable uniformity, workability, density and strength, they work a hardship in a great many cases by eliminating from use sands which are entirely satisfactory. On the other hand, when the limits are made broad enough to avoid causing too many hardships, some unsatisfactory materials will be admitted and, also, the door is left open for variations in grading which are undesirable from the point of view of uniformity, even though the various gradings may, in themselves, be satisfactory.

To guard against the last-named difficulty (unsatisfactory uniformity) specifications for concrete sands in recent years have included a uniformity clause, the National Sand & Gravel Assn. points out, which requires that sand for any one project shall not vary in fineness modulus more than a stated amount from the average sample submitted before the start of the work. That limitation has been of assistance in maintaining uniformity and, on the whole, has presented few, if any, difficulties to the producer. It has, however, fallen short of accomplishing something that many engineers feel should be accomplished, particularly in a grading specification *national in scope* and applicable to all classes of concrete work; that is, provision for the use of coarser sands in richer mixtures and finer sands in leaner mixtures—when a choice of such sands can be had economically.

The proposed grading specification and recommended practices for fine aggregate published in the Progress Report of the Joint Committee on Concrete and Reinforced Concrete (a committee composed of representatives of six major national technical groups) represent an endeavor to provide for two controls—uniformity and coarseness (or fineness) of grading. First, that specification suggests that "fine aggregate shall be graded from coarse to fine within the limits shown" in Table I.

TABLE I.

Sieve Size	Total Passing *(% by weight)*
⅜ in.	100
No. 4	95-100
No. 16	45-80
No. 50	5-30
No. 100	0-8

Those limits are quite broad and would allow of the use of either an extremely coarse or an extremely fine sand. Obviously, it would be undesirable to receive on a given job a sand which varied over the entire range, although it is clear that a sand at either extreme might be the most desirable one under certain circumstances. Those broad grading requirements are supplemented, therefore, by a clause on *uniformity*, reading as follows:

"For the purpose of controlling the grading of fine aggregate from any one source, a preliminary sample shall be submitted, prior to actual deliveries. This sample shall be representative of the material which it is proposed to furnish. Any shipment of fine aggregate made during the progress of the work which shows a variation in fineness modulus greater than 0.20 either way from the fineness modulus of the preliminary sample shall be rejected or, at the option of the engineer, may be accepted subject to such changes in concrete proportions as may be necessary by reason of failure to comply with the requirements of this section."

The uniformity clause does not, of course, go the point of providing for the use of coarsely-graded sands in rich mixes or finely-graded sands in lean ones. The Joint Committee has attempted to take that factor into account by the following statement in the "recommended practices" (not specification) portion of its report:

"Attention is called to the fact that the relatively wide range in grading which is shown in Sec. 208-S (Note: See Table I) should be permitted only when it is economically impracticable to obtain materials meeting more restrictive requirements. The most desirable grading will depend upon the type of work and the class of concrete. For the leaner mixes, or when a small size coarse aggregate is used, in cases where the degree of workability is important, it is desirable to further restrict the allowable ranges in sizes shown in Table I so as to insure a grading approaching the maximum percentage passing each sieve. On the other hand, for the richer mixes, in the interests of maximum strength and economy, a grading as coarse as is consistent with the requirements for workability should be specified. However, in no case should a range in grading on any one sieve less than indicated below be required:

No. 16 sieve ..... 20 per cent.
No. 50 sieve ..... 15 per cent.
No. 100 sieve ..... 5 per cent."

Following the preceding recommendation an engineer might, for example, write a "fine", "medium" and a "coarse" specification somewhat as shown in Table II. Even these restricted gradings would allow a range in fineness modulus greater than 0.40 (plus or minus 0.20) and, therefore, the uniformity clause mentioned previously would still be applied.

TABLE II.

Sieve Size	Total Passing *(% by weight)*		
	Fine Sand	Medium Sand	Coarse Sand
⅜ in.	100	100	100
No. 4	95-100	95-100	95-100
No. 16	60-80	50-70	45-65
No. 50	15-30	10-25	5-20
No. 100	3-8	1-6	0-5

It is too early to say whether or not these recommended requirements of the Joint Committee, if finally adopted, will lead to additional confusion and result in hardship to producers of sand and gravel. Certainly, it would be unwise to attempt to apply them blindly and without first making a careful study of local conditions. Nevertheless, it should be recognized that greater attention to grading of fine aggregate is required if progress is to be made in the elimination of some of the unfortunate examples of concrete with which all of us are familiar.

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RECENT PROGRESS IN HIGHWAY RESEARCH*

IN the earlier days of concrete little thought was given to the nature of the mineral aggregate used except to require it to be durable and reasonably hard. The aggregate was considered largely as a filler material necessary to reduce the amount of the more expensive ingredient, cement. With the development of our present knowledge of the relationship between strength and water-cement ratio came the realization that grading of the aggregate plays an important part in controlling the amount of cement necessary to produce concrete of a given strength. But still little or no attention was given to the possibility that inherent characteristics of the aggregate, as well as its grading, might affect the strength of concrete. It was generally assumed that strength was controlled entirely by the water-cement ratio and that so long as the aggregate was sound and durable its other characteristics were of no importance.

We have now learned that characteristics of the aggregate, other than soundness and grading, are important. We know that flexural strength, the essential strength characteristic of paving concrete, may be influenced greatly by the kind of coarse aggregate used. In extreme cases a change in the kind of coarse aggregate may cause a reduction in flexural strength as great as would be caused by the omission of 1 sack of cement per cu.yd. of concrete. The nature of the coarse aggregate can not be ignored when designing concrete-paving mixtures.

Design of Mixtures.—For a given combination of aggregates and cement the flexural strength of the concrete is governed by the well-known water-cement-ratio law. That is, the strength increases as the ratio of water to cement decreases and, for a fixed ratio of water to cement, reasonably uniform strengths may be expected. However, this does not mean that with some fixed water-cement ratio the same strengths will necessarily be obtained with all kinds and combinations of aggregates. With the same water-cement ratio the strengths of two concretes may be quite different, depending entirely on the kind of aggregate used. These facts have led the U. S. Bureau of Public Roads to favor the so-called trial method of designing concrete for pavements.

The trial method of design makes it possible to differentiate between available aggregates on the basis of their influence on flexural strength. The water-cement ratio that should be used with each different combination of aggregates to obtain the desired or specified strength is determined by means of controlled laboratory tests. Differences in the characteristics of the aggregates available in a given territory are likely to cause variations in the water-cement ratio required for different combinations of materials, with resulting variations in the amount of cement required per cubic yard of concrete. Hence, the aggregate producer's interest in this method of design.

Arguments are advanced both for and against the trial method of design. In its favor is the fact that it enables us to utilize our present knowledge to obtain, irrespective of the aggregates used, concrete pavements of reasonably-uniform strength. Opposed to it is the argument that strength is not the only desirable characteristic of concrete, that durability and freedom from cracking are of equal or greater importance, and that the method does not insure the production of concrete having these characteristics. While this is true, it does not seem reasonable to ignore the few facts already established while awaiting that far-distant time when all the facts will be known. The knowledge required to insure the manufacture of concrete of unquestionable quality remains to be developed by future research.

The trial method of concrete design is not one to be used indiscriminately and without restriction. It is obvious that the laboratory tests should be made with the greatest care and in accordance with a standard procedure in order to avoid the possibility of unfair discrimination. The method should be adopted only by organizations prepared to exercise this requisite laboratory control and to perform expeditiously the many tests which will be required. Furthermore, the method should not be used without placing some limitation on the minimum cement factor and the maximum water-cement ratio. Otherwise non-durable concrete may result in spite of a satisfactory initial strength. Cement is the binding medium in concrete and certainly there is some lower limit of the cement content below which we should not go if that in concrete subject to severe weathering the water content should not exwe are to expect durable construction. With respect to the water-cement ratio research and experience both indicate ceed 6 gal. per sack of cement.

Durability of Aggregates.—The durability of concrete is dependent on a number of factors and important among these is the soundness or durability of the aggregates used. The problem of developing some method of test that will be a definite measure of the durability of aggregates is still unsolved. It would appear that the sodium-sulphate test, which is the one most commonly used for this purpose, should be a good measure of the ability of an aggregate to resist weathering, particularly frost action. In reality the test is not wholly satisfactory because of the difficulty of controlling important variables in the test procedure. The inability of different laboratories always to check each other and the frequent inability of a single laboratory to check its own results have cast doubt on the reliability of the test and the significance of the results obtained. In view of these uncertainties the question is raised as to the test limits that should be adopted if the test is used, and even if it should be used at all as the basis for the acceptance or rejection of the aggregates. On the other hand we need a laboratory measure of durability and definite specification requirements. The majority of engineers are no longer satisfied with the indefinite and practically meaningless general causes of the past. Aggregates of unquestioned soundness are required if concrete construction is to withstand the ravages of time.

Until some better measure of durability is developed it is believed that the use of the sodium-sulphate test should be continued, but only as a warning of possible unsoundness. Provision should be made for the acceptance of aggregates failing to meet the test if a satisfactory service record for such aggregates can be established. Requirements of this character appear in the present federal specifications. In this period of uncertainty the producers of

* Presented at the 1937 convention, National Crushed Stone Assn.

aggregates can render valuable assistance in the production of good concrete by continuous and rigorous inspection of their own products and the elimination from shipment of any questionable materials disclosed by such inspection.

Los Angeles Abrasion Test.—The Los Angeles abrasion test gives every evidence of being a much more satisfactory method for measuring the resistance of coarse aggregates to wear and impact than either the Deval abrasion test or the standard toughness test. The Los Angeles test, which takes its name from the city of its origin, has been used for a number of years by the Division of Highways of the California Dept. of Public Works and more recently has been adopted by a number of other state highway departments. It is now proposed for adoption as a standard method of test of the American Assn. of State Highway Officials.

This method of test, which is comparatively new from the standpoint of its general recognition, has the following advantages. The equipment and procedure are simple and easily standardized and it is possible for different laboratories to check each other's work with a very satisfactory degree of accuracy. In a recent investigation by 18 coöperating laboratories 49 tests were made on a sample of crushed stone. The mean deviation from the average of all test results was only 5.6 per cent. and the average results from only two laboratories deviated from the grand average by more than 10 per cent. In spite of the fact that not all the laboratories used identical equipment or followed exactly the same procedure this is a much better agreement between check tests than could be expected with the Deval abrasion test. In addition to its greater accuracy, the test requires much less time than does the Deval test.

The degree of angularity of the aggregate particles has very little influence on the results of the Los Angeles test. Approximately the same results are obtained with crushed stone and rounded gravel of comparable quality. Thus, in establishing the specification requirements for the abrasion loss of coarse aggregates for a given purpose it should be possible to specify the same maximum loss for all materials regardless of their type. This, of course, is a procedure which can not be followed with the Deval test. On the other hand, the shape of particle does have a marked effect on the test results. Aggregates containing flat or elongated fragments in amounts usually considered objectionable show a much higher percentage of wear than do aggregates of similar quality composed of rounded or cubical particles.

In the case of rock the Los Angeles test is made on the crushed material as prepared for use in the work and may be made either before or after delivery of the material. This is not true of either the Deval abrasion test or the standard toughness test, both of which require the use of ledge rock that may not truly represent the crushed material subsequently furnished.

In the Los Angeles test the loss is produced largely by impact and thus may be expected to eliminate the need for the standard toughness test which has not proved to be entirely satisfactory. The toughness test has caused much trouble on account of its sensitiveness to variables that are difficult to control and the added fact that many rock materials are border-line products from the standpoint of the usual requirements for toughness. Defects in the testing apparatus, even though apparently slight, have often spelled the difference between acceptance or rejection of materials.

Finally, there appears to be a better agreement between test results and the behavior of aggregates in service than is the case with either the Deval test or the toughness test. As a result of the rather limited study already made it is possible to establish tentatively a maximum abrasion loss of 40 per cent. for aggregates that will be satisfactory in bituminous surface treatments. However, additional work must be done before we can be sure of the requirements that should be specified either for this type of road surface or for the other types of highway construction in which coarse aggregates are used.

The interest that has been shown in the Los Angeles abrasion test and the eagerness with which it is being accepted for study by many testing engineers is an indication of the widespread dissatisfaction with the older methods of test. The general abandonment of both the Deval test and the toughness test in favor of the Los Angeles test is anticipated and when this takes place we shall have made definite progress in the evaluation of aggregates for use in road construction.

Vibration of Concrete.—One of the outstanding developments in construction during the past several years has been the introduction of high-frequency vibration as an aid in placing concrete. Internal vibrators with which remarkable results can be obtained in the placement of dry, harsh concrete in mass or reinforced structures are available. Surface vibrators, with which equally surprising results can be obtained, are available for use in the construction of concrete pavements and, more recently, vibratory equipment of the internal type has also been developed for this purpose.

Extensive investigations have been made by the Bureau of Public Roads and other agencies of surface-type vibrating finishing machines as compared with ordinary finishing machines. These have shown that vibration allows the use of a higher percentage of coarse aggregate and a lower water content than would otherwise be required and that it results in concrete of greater density than would otherwise be obtained. Advantage may be taken of the lower water content to obtain, with the same cement content, concrete of higher strength than can be obtained with standard finishing machines, or, with a lower cement content, the same strength. The higher density which may be secured by vibration and the smaller amount of fine aggregate required may be expected to result in pavements having greater durability and less tendency to scale. In the casting of concrete in structures the use of the internal vibrator may be expected to show similar advantages as compared with the ordinary methods of hand placement.

The merits of vibration as applied to pavement construction have been established beyond reasonable doubt and, moreover, the facts have been available for several years. In view of this it has been somewhat surprising that so little practical use has been made of the method. This may be due to conservatism in the adoption of new methods or to the cost of the necessary equipment and its operation. Whatever the cause, the advantages of vibration are so manifest that its general application to concrete-pavement construction will not be delayed indefinitely.

Affinity of Aggregates for Asphalt.—If an asphaltic paving mixture is to render satisfactory service it is required, among other things, that the asphaltic material shall thoroughly coat the particles of mineral aggregate and that this coating shall be of a permanent character. If the coating fails to adhere tenaciously to the particles of aggregate, disintegration of the pavement may be expected. It is a well-known fact that some aggregates are unsuitable for use in asphaltic pavements, without some special treatment, due to their inability to be coated or to remain coated with films of the bituminous material. When asphaltic emulsions are used, there may be failure to obtain a coating which is even apparently satisfactory, while other asphaltic mixtures that initially appear to be satisfactory may fail in service due to the gradual stripping of the asphalt films from the aggregate particles. It is reported that in extreme cases quarries have been practically

abandoned on account of the fact that their products have been responsible for this type of failure.

The trouble, when trouble exists, is due to the fact that the rock material has a greater preference for water than for asphalt. This phenomenon has given rise to two terms that are rapidly coming into general use among asphalt technicians: "hydrophilic" to describe an aggregate that has a greater affinity for water than for bitumen, and "hydrophobic" to describe an aggregate that has a greater affinity for bitumen than for water.

The importance of satisfactory adhesion between stone and asphalt and the disastrous results that may attend the use of hydrophilic aggregates have been known for many years, but the general recognition of these facts is a comparatively recent development. The subject is one that is increasingly engaging the attention of engineers concerned with asphaltic-road construction. Numerous investigations of adhesion and the wetting properties of aggregates and bitumens have been made, but much remains to be done. The studies of the past have merely indicated the possibilities of future research. The problem is primarily one of surface chemistry and its interest to the producers of aggregates lies in the possibility of developing means for changing the surface characteristics of aggregates that otherwise would be unsuitable for use. . . .

Soil Research and Stabilized Roads. —And now we come to the most important development of recent years in the field of highway research. This is the really amazing progress that has been made in the study of soil materials with respect to their use in highway construction. Only a few years ago a knowledge of soils that was of any practical value to the highway engineer was virtually non-existent. Now the value of soil science in its application to road construction is established. To the natural satisfaction of the research worker in giving new facts to the world is added, in this case, the gratification of having these facts accepted as being immediately useful. . . .

Stabilized soil roads may be defined in a general way as road surfaces composed of fine-grained soils, either with or without mineral aggregates, in which sufficient strength has been provided, by any one of several methods, so that they can carry traffic at all seasons of the year without structural failure.

In the early days of the development of satisfactory soil-type roads stabilization consisted in providing satisfactory strength by the proper combination of soil materials of suitable quality and grading with fine and coarse granular materials. Dr. C. M. Strahan of the University of Georgia was a pioneer investigator of the effect of the grading of materials, as determined by sieve analysis, on the performance of gravel, sand-clay and top-soil roads. While the name "stabilized roads" was not in use at that time, the roads studied by Dr. Strahan were actually of the stabilized type. As early as 1917 he recommended a grading for the best roads of this class and this ideal grading has not been changed essentially up to the present time. In 1922, long before the necessary tests had been developed, he suggested the need for determining the properties of the fine-grained binder material, pointing out that small amounts of highly colloidal clay might be expected to furnish adhesive strength equal to that furnished by greater amounts of less active material. The tests necessary for the purpose are now available and form the basis for the selection of binder materials for stabilized roads.

As the demand for greater mileages of low-cost roads increased, the use of deliquescent and water-retentive chemicals, such as calcium chloride and sodium chloride, was introduced as a valuable supplement in the construction and maintenance of those stabilized road mixtures that are dependent on proper grading. Also, for the stabilization of fine-grained or poorly-graded soils there was introduced the use of water-insoluble binders, such as asphaltic emulsions and, more recently, of other bituminous materials and Portland cement. . . .

In stabilized roads of the graded type mineral aggregates are definitely required, while in roads stabilized with bituminous materials or Portland cement it has been found that, even though aggregates may not be essential, their use is advantageous from the standpoint of economy. Here is a market for quarry products, particularly the finer materials that frequently are wasted, and the industry has an opportunity, if it so desires, to enlarge and extend this market.

The production of stabilized mixtures by any of the present methods is not a hit-or-miss procedure. There is required a knowledge of the soil tests and their use, and the proportions in which the materials should be combined. In addition, it is advantageous to secure a greater control of uniformity of proportioning and mixing than may always be attained by road-mix methods. This suggests plant production which already has been used with success by several state highway departments. The establishment by the aggregates producer of proportioning and mixing plants at convenient locations would provide a service welcome to many engineers and would do much to extend the use of stabilized mixtures to the smaller political units, such as towns and counties, where the requisite technical knowledge is not always readily available. . . .

Gypsum Output Climbs in Second Quarter

Following the marked improvement in output and sales during the first three months of 1937, the gypsum industry in the second quarter of 1937, showed healthy increases over the same period of 1936, according to quarterly returns compiled by the Bureau of Mines. Crude gypsum and gypsite mined totaled 897,114 short tons, a gain of 22.3 per cent. Imports of crude rock as reported by the operators, increased 75.1 per cent. and sales of uncalcined gypsum of domestic and foreign origin in the second quarter of 1937 were 13 per cent. above the corresponding quarter in 1936. Calcined gypsum produced from domestic and imported rock amounted to 664,616 tons, an increase of 21.8 per cent. over the 1936 period.

Sales of plasterboard and lath rose to 187,896,202 sq. ft., in the second quarter of 1937 and again showed the largest relative gain, 61.6 per cent., of the calcined products reported. Increases in sales of other calcined products varied from 7.9 per cent. for partition tile to 26.2 per cent. for calcined gypsum sold to potteries, terra-cotta plants, plate-glass works and for other manufacturing uses. Sales of base-coat plasters amounted to 370,568 tons, representing an increase of 22 per cent. over the second quarter of 1936.

Data for the first six months of 1937 show greater percentage increases over 1936 than were indicated for the second quarter alone. Crude gypsum mined in the first half of 1937 totaled 1,503,637 tons, 38 per cent. more than in the corresponding period of 1936. Imports, as reported by the operators, were 83.1 per cent. higher, and calcined gypsum produced and uncalcined gypsum sold rose 40.8 per cent. and 26.5 per cent., respectively, compared with the first six months of 1936.

The Valley Concrete Pipe Co., Yuba City, Cal., has installed machinery for the production of concrete building tile.

The Arkansas City Sand & Gravel Co. has completed a 700-ft. railroad spur and loading ramp at its plant to speed up loading operations.

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Basing Point and Freight-Zone Price Systems Under the Anti-Trust Laws[1]

THE report of the Federal Trade Commission to the President on Steel Sheet Piling[2], the Wheeler Anti-Basing Point Bill[3], and the government's attitude toward uniform prices[4] again focus the attention of businessmen on the legality, as well as the commercial value, of basing-point or freight-zoning systems. There has been a pronounced trend in recent years for sellers to meet competition by adopting various more or less mechanical methods of dealing with freight costs in arriving at a final sale price[5]. Thus, in an increasing number of industries the practice of employing "basing - point", "multiple - basing - point", and "delivered-price" systems has become customary[6].

The purpose of most of these systems has been, in the main, threefold: (1) to simplify figuring freight quotations[7]; (2) to enlarge the market of a given manufacturer by enabling him to quote a price which, by absorbing some freight charges, will compete with (or by adding additional charges for freight will be identical to) that of another manufacturer whose factories are situated in some other locality; in other words, it is an attempt to eliminate geographical position as a substantial element in competition; and (3) to enable competitors to agree on, or otherwise to arrive at, uniform prices with greater ease, pursuant to some understanding between them[8]. The first reason for using such systems is of undoubted legal validity. The second has been seriously questioned in this respect by the Federal Trade Commission[9], and the third is certainly *prima facie* illegal since it amounts to a violation of Sec. 1 of the Sherman Act[10]. These three are by no means the only advantages of such systems. In addition, there is for some products an advertising advantage in being able to offer a uniform price, and such systems eliminate the mechanical unwieldiness and the prohibitive cost of price schedules which would otherwise have to be translated from a maze of differing freight rates into a price schedule which would reflect those differences[11].

The charge was repeatedly made by consumers, economists, and others[12] that such methods of arriving at prices amounted to discrimination under the old Sec. 2 of the Clayton Act[13] in that the sellers have, after making an allowance for the cost of transportation among their various customers, exacted higher prices from customers having little or no transportation expense and accepted lower prices from those having heavy transportation expense. The same argument against the validity of such practices will undoubtedly arise under the Robinson-Patman Act[14].

Another criticism of such systems is that they result in the receiving by the government and others of identical bids or price quotations from manufacturers[15]. To blame such uniformity solely on delivered-price systems is to overlook the distinct possibility that prices on a standardized commodity will tend to be uniform if effective competition exists. It is, of course, apparent that such freight systems might be a great aid in helping to police price agreements, but the systems themselves might still not be illegal. It should perhaps be pointed out that mere uniformity of price is not *per se* illegal. Even uniformity of prices arrived at by merely "following the leader" is not illegal, except where there is an agreement or understanding among competitors that they will do so[16]. This type of economic

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[1] Reprinted from the University of Pennsylvania Law Review, Vol. 85, No. 7, May, 1937.

[2] Fed. Trade Com. *Report on Steel Sheet Piling*, 1936. This report was referred by the President to the Attorney General on June 15, 1936, for appropriate action. NEW YORK TIMES, June 22, 1936, p. 1, col. 1.

[3] S. 1581, 75th Cong., 1st Sess., (1937), introduced Feb. 17, 1937, 81 CONG. REC., legis. day Feb. 15, 1937, at 1562. This bill is identical with S.4055, 74th Cong., 2nd Sess. (1936), introduced Jan. 16, 1936, 80 CONG. REC. 2408 (1936), and H. R. 11329, 74th Cong., 2nd Sess. (1936), introduced on the same day, 80 CONG. REC. 2534 (1936). See also a proposed amendment to Sec. 2 of the Clayton Act, H. R. 10486, 74th Cong., 2nd Sess. (1936). These anti-basing-point bills are discussed in more detail *infra*, and see *Hearings before Senate Committee on Interstate Commerce on S. 4055*, 74th Cong., 2nd Sess. (1936).

[4] *Id.* at 286-288; see editorial, NEW YORK JOURNAL OF COMMERCE, June 23, 1936, p. 2, col. 1.

[5] Fed. Trade Com., ***supra* note 1, at 37-39.**

[6] The following industries use a zone-price system: iron and steel, tobacco products, thread, stoves, mahogany, asphalt, mastic tiles, salt, bathtub, alcohol, coffee, soap, corn products, linseed products, cereal products, newsprint, paper, gasoline and oil products, wire and cable, valve and fittings.

The following industries use basing-point systems or modifications thereof: lumber, steel and iron, cement, zinc, corn products, copper, fertilizer, gasoline, lead, sugar, laundry machinery, crane and shovels, flour, range boilers, bolts, nut and rivets, cast-iron pipe, asphalt roofing, linseed oil. It should be noted that some materials are sold part on one and part on the other system. Generally speaking, the industries using such freight systems are those which have standardized products, or products which conventionally are of uniform grade and quality.

[7] The United States parcels post service and the American Express Company both use zoning systems as a matter of convenience.

[8] Fed. Trade Com., *supra* note 1.

[9] See the following Fed. Trade Com. reports: ***The Price of Gasolines in 1915-1917***, 1918, at 149, 150, 153-154, 156; *The Advance in the Price of Petroleum Products*, 1920, at 54; *Commercial Feeds*, 1921, at 120 n., 163-164; *Lumber Manufacturers' Trade Associations*, 1922, at 121; *Western Pine Manufacturers' Assn.*, 1922; 2 *Home Furnishings*, 1923, at 89; *Northern Hemlock & Hardwood Manufacturers' Assn.*, 1923, at ix; *Prices, Profits and Competition in Petroleum Industries*, 1928, at 71; *Newsprint Paper Industry*, 1930, at 37-44; *Price Bases Inquiry: The Basing-Point Formula and Cement Prices*, 1932; *Basing-Point System in the Iron and Steel Industry*, 1934; *Practices of the Steel Industry under the Code*, 1934; *Range Boiler Industry*, 1936; *Steel Sheet Piling*, 1936; and see Fed. Trade Com. *supra* note 1. See also Tariff Com. Information Survey, *Cotton Thread*, 1927.

[10] 26 STAT. 209 (1890), 15 U. S .C. A. § 1 (1927).

[11] *Supra* note 6.

[12] See especially Fetter, *The Masquerade of Monopoly* (1931); Note (1932) 45 HARV. L. REV. 548.

[13] 38 STAT. 730 (1914), 15 U. S. C. A. § 13 (1927).

[14] 49 STAT. 1526, 15 U. S. C. A. § 13 (Sup. 1936).

[15] Fed. Trade Com., *supra* note 1, at 286-288, where Secretary of the Interior Ickes lists some 48 industries where identical prices have been bid.

[16] *United States* v. *International Harvester Co.*, 274 U. S. 693 (1927). The court states: "And the fact that competitors may see proper, in the exercise of their own judgment, to follow the prices of another manufacturer, does not establish any suppression of competition or show any sinister domination." *Id.* at 709. Compare also *Pacific States Paper Trade Assn.* v.

discrimination may properly be called geographical discrimination, because the amount of transportation service provided varies as between different customers. Geographical discrimination may be said to exist whenever sale prices, after the proper deduction of transportation costs (which are usually capable of being exactly determined), yield net prices at the factory or warehouse which differ because of the geographical location of buyers[17]. Such discrimination would cease to exist only when the net at the point of shipment received from all sales would be uniform at a given time. The fact that such practices often result in economic discriminations does not render them illegal under the anti-trust laws.

The systems which are employed so as to manage or manipulate freight costs are numerous, the best known being the so-called "Pittsburgh-plus" plan[18] of the steel industry. The old "Pittsburgh-plus" was a basing-point system by which steel products were sold at a price equal to the factory price plus the actual cost of freight from Pittsburgh to any destination. This freight charge from Pittsburgh was added even though the steel may not have been actually shipped from there, with the result that purchasers in Chicago paid freight from Pittsburgh, although the steel would probably be shipped from the neighboring mills at Gary, Ind. Custom, central location, and superior competitive position were probably instrumental in the establishment of Pittsburgh as the steel basing point, and the custom was solidified by agreement or understanding or for the sake of convenience, even after some of the more fundamental reasons for its establishment had ceased to exist.

The single basing-point system was one of the earliest methods of arriving at an artificial equalization of freight charges. The need for added basing points due to competition from factories in new localities has led to the so-called multiple-basing-point system, wherein prices are determined as of the basing point nearest the purchaser. Other systems are to sell on a flat delivered price for a given area or for the entire country, or to divide the country into freight zones and sell products at a uniform delivered price for each zone. All these systems have much the same purpose and in general operate with similar effect, although the economic situation in some industries seemed to make one system more adaptable than another.

Any discussion of the law of such freight systems requires a clear understanding of the economic background of the various practices[19]. The Supreme Court has repeatedly pointed out the necessity of clearly understanding the factual background in each anti-trust case[20]. For that reason the facts which are typical of a number of manufacturing industries will be set forth briefly.

The manufacturers in these industries, which in the main had grown up along the Atlantic seaboard, originally sold their products f. o. b. factory, charging the actual freight to the destination, if a delivered price were desired. By the early years of the twentieth century some companies had varied this method of arriving at a sale price, so that some large producers sold at a uniform delivered price in each state, while others sold on actual freight east of the Mississippi River and had adopted a modified basing-point system west of the Mississippi. During the World War the War Industries Board adopted a plan in placing orders for cantonment camps in order to insure an adequate supply of necessary materials. The board also approved a zoning plan for certain industries, apparently with the thought that this was also necessary in order to insure an adequate supply of equipment. After the war and the depression of 1920 the practices of these industries were rapidly becoming more uniform in sales of competing products. Products which were smaller in size and weight, since they were not subject to such noticeable price variations when the actual freight was charged, generally used a close approximation to the actual freight rates from the points of production to those of consumption. The larger and heavier products, for which price variations due to freight costs were substantial, came to be sold by most producers on a basing-point or a freight-zone system.

The National Recovery Administration took no stand on the question of geographical discrimination in price[21]. As a result, a number of the codes provided for freight-zone, basing-point, or delivered-price systems[22]. In industries such as lumber, cement and insulated cable, where these practices had become an industry custom or practice before the codes, they were continued under them, and the practices became more standardized due to the existence of open-price filing provisions in the codes. All the N. R. A. codes had a pronounced effect upon their respective industries in crystallizing and unifying industry practices, especially if they provided for open-price filing[23]. The termination of the N. R. A. era, therefore, generally left industry practices stabilized.

The fact that most of the factories in many industries were located in New York, New Jersey, Pennsylvania and Connecticut seemed to aid those industries in arriving at freight systems. The freight zones, then, which these industries used, represented places which would have had approximately equal freight rates for goods shipped from New York City, and the

Federal Trade Commission, 4 F. (2d) 457 (C. C. A. 9th, 1925), modified, 273 U. S. 52 (1927).

[17] There are, of course, methods of arriving at a varying mill-net price other than the use of basing-point, freight-zone or delivered-price systems. Rebates, special freight allowances, or varying charges for freight pick-ups may be utilized so as to reach the same result. In general the legality of such rebates may be seriously doubted, especially under the Robinson-Patman Act. This subject will, however, not be considered herein.

[18] Berglund, *The United States Steel Corporation* (1907) 164-167; Krentzberg, *The Passing of "Pittsburg-Plus"* (1923) 17 AMERICAN BANKERS' ASSOCIATION JOURNAL, 301. No detailed history of the origin of Pittsburgh-plus is available; testimony before the Federal Trade Commission in Matter of the United States Steel Corporation, 8 FED. TRADE COM. DEC. (1924) 1, indicates that it was in use in the sale of beams in 1880, but was not generally applied until after the formation of the United States Steel Corp. in 1901. By 1907 it was well established. Berglund, *loc. cit. supra.*

[19] For a good discussion of the general economic background of such freight systems see Burns, *The Decline of Competition* (1936) 280-371.

[20] *Appalachian Coals* v. *United States*, 288 U. S. 344, 30-361 (1933); *Sugar Institute* v. *United States*, 297 U. S. 553 (1936).

[21] But see Richberg's remarks in *Hearings before Senate Committee on Interstate Commerce*, *supra* note 2, at 85-86: "It was our observation, and it was the opinion of the experts outside whose aid we obtained, that a basing-point system in which every producing area was a basing point would be a sound and economical system and good business practice. In other words, if there were a lot of mills within a small radius of 25 to 50 mi. of Pittsburgh, as a business practice there was nothing wrong, and a great deal of convenience and benefit in having one basing point for that area. The evil in the basing-point system that seemed to me evident from the beginning, and which I think is partly historical growth and partly the result of the power of certain large interests in the industry, has been the denial of basing points to certain producing areas that ought to have basing points, and, as a result, the establishment of artificial basing points in nonproducing areas, giving a special advantage to the producing areas which did have basing points."

[22] Six codes provided for freight systems. They were: Fertilizer, Petroleum, Business Furniture, Storage and Filing Equipment, Salt, and Shovel, Drag-line and Crane. Five codes provided for basing-points. They were: Cast-Iron Pipes, Iron and Steel, Lime, Refractories, and Reinforcing Materials. Thirty-three other codes provided for delivered prices of some kind. For further material see Consumer Advisory Board, *Appendices to Memorandum to General Johnson*, Feb. 19, 1934.

[23] Fed. Trade Com., *supra* note 1, at 6.

freight-zone charges were approximations of actual freight costs. As factories were built in other sections of the country, freight-zone charges bore less relation to the actual costs of transportation.

When basing-point or freight-zone systems are employed, prices are generally quoted on a delivered-price basis. As a result, customers are not aware of how much of the final price is in fact a charge for freight[24]. Under these systems each manufacturer defrays at times a part of the actual transportation costs; at other times he may receive more than the actual freight costs if he is located near the consumer, and he charges the railroad freight from some recognized center of production or an average zone freight rate.

The trend in these industries, as in many others, has been to charge transportation cost on products which were light in weight and easy to ship at the actual freight rate, or to use a flat delivered price for the entire country, since in either case competitors having similar factory prices would have comparable prices f. o. b. the customer's city. With heavier or bulkier items, since the differences in price would vary considerably with the distance from the customer's city, and the manufacturer nearest any given purchaser had such an advantage, competitors were forced to: (1) abandon their efforts to compete, (2) lower their factory price so that that price plus freight was competitive, or (3) maintain the current factory price in appearances and absorb some of or all the freight charges. The manufacturers in many industries chose to employ the third alternative as long as they could realize a sufficient price on their product to pay the current costs of production plus transportation and a proportion of their current obligations on their fixed charges.

Manufacturers believed, and no doubt they arrived at their belief through sad experience, that it was virtually impossible to maintain one factory price for customers located close to a factory while maintaining progressively lower prices as the customer's situs approached the factory of an effective competitor. All customers on learning of the lower price would demand it and feel entitled to it. Delivered-price policies, basing points and freight zones were all devised to enable the manufacturer to quote competitive prices in a district close to a competitor's factory without apparently reducing the factory prices.

[24] *Hearings before Senate Committee on Interstate Commerce, supra* note 2, at 322.

Freight-zone policies had to be strictly adhered to or they would break down. If purchasers were allowed to have goods shipped to a point in one zone and were then to pay the actual freight to another zone, the resultant price might be less than the delivered price to that zone and the system would crumble of its own weight. As a result, sellers never quoted any price other than that of the customer's city, and a purchaser was not allowed to purchase f. o. b. manufacturer's mill except at a price equal to that which would have been charged at the ultimate destination. As a logical result, allowances were often not made to purchasers even though the goods were shipped by water or by other methods cheaper than the standard all-rail freight. Manufacturers seemed to feel that these delivered-price practices were necessary in order to maintain their system, since purchasers would always have taken the cheaper alternative and thus have made the manufacturer absorb a larger proportion of the freight charge on distant shipments, preventing him in some cases from equalizing the freight charges among all his customers.

Economically, and presumably legally, identical problems are presented by flat delivered prices and by freight-zone adders, provided all the plants manufacturing the product are to be found in one single zone. The problems are identical because the price in the basic zone, where the factories are located, is a flat delivered price. As far as zones other than the basic one are concerned, since the freight zones have increasing freight charges, the resulting price more nearly equals the mill price plus the actual freight. Freight zones are, therefore, at least in part a recognition of the fact that freight costs may be competitive elements. Flat delivered-price systems and basing-point systems where the factory is not located at or near the basing point represent a wider departure from the so-called pure competitive position, since the actual freight in the price of the article has little to do with the actual cost of the freight.

The location of plants outside the basic zone which charge basic-zone prices plus freight from that zone would seem to be economically unjustifiable unless costs of production are higher. Such manufacturers must consider, before lowering their prices, that these lower price levels would compel competing manufacturers to install branch factories which would overexpand the production in that area and might lead to an even smaller volume of business. The factory located nearer to certain customers has an advantage in the point of delivery time which is bound to give him a sufficient volume of business in a stabilized market.

The contention has been made that free competition can exist only if goods are sold at a price equivalent to the cost plus profit at the point of shipment plus the actual cost of freight to the destination, and that any other practices involve illegal discrimination[25]. Acceptance of this assumption would involve the prohibition of selling goods over any area, however small, at a flat delivered price. The argument that flat delivered prices for any given area prevent customers from freely competing with each other at the point of production has some merit, provided it is not carried to its logical but absurd extreme of requiring a department store to make varying delivery charges to customers living in the same urban area. When viewed on a national scale, it is apparent that such systems must necessarily operate in certain instances to discriminate against customers adjacent to the point of production (or near freight-zone lines), since they may be required to buy goods and freight when they are interested solely in buying goods[26]. Those advocating this contention then point out that the result of this system is wasteful cross-freighting, in that it enables manufacturers to compete outside the spheres surrounding their factories. This evil of cross-freighting has certainly been overemphasized[27], although

[25] This contention was made by Fetter, Commons, and Ripley as expert witnesses for the Fed. Trade Com. in *Matter of the United States Steel Corp.*, 8 FED. TRADE COM. DEC. (1924) 1.

[26] A logical extension of these arguments would require a seller to itemize all his costs, and would make it illegal to sell below the total even to meet competition in good faith.

[27] In *Fertilizer Industry Price Filing Study*, NRA Work Materials No. 67, at p. 33, it is stated that: "This very brief survey would indicate that cross-shipping between (freight) zones is not a very serious problem." In Fed. Trade Com., *The Basing Point Formula and Cement Prices*, 1932, at 134 *et seq.*, it is estimated that the cross-haul in the cement industry results in a waste of $42,000,000. The study, however, is not very complete, and is more in the nature of an estimate. See also Richberg in *Hearings before Senate Committee on Interstate Commerce, supra* note 2, at 86: "I want to say as a general proposition, which I believe to be correct, that for the consuming public as a whole, I think our investigations developed that more freight was absorbed than excess freight was charged. That is, in order to meet competition in these competing areas the producer has to absorb a great deal of freight . . . . as to the industry as a whole, in relation to its customers, we had one investigation made which showed a large excess in favor of the customers. That is, there was more freight absorbed than excess freight charged. So that I think, from the standpoint

its full extent would be ascertained only if a thorough study were made. Opponents of such systems also charge that they artificially maintain plants that were established under economic conditions which no loner exist. As a result, therefore, uneconomic factories are maintained in order to protect past investments[28]. It is possible to agree, in the main, with these contentions in so far as they are demonstrations of pure economic theory, but it is another question when this economic theory is attempted to be read into the anti-trust laws, since there are types of discrimination which are not subject to their operation. The basic legal question is whether or not the law sanctions only price policies which make proportional allowances for differences in the costs of transportation.

It has been found convenient to discuss the freight systems with reference to each of the anti-trust laws separately. The Sherman Act is considered first because of the fact that more cases bearing on this question are found under it, even though the act is not primarily concerned with price discrimination.

The Sherman Act.—Since the Sherman Act[29] is primarily concerned with agreements, combinations, or conspiracies which restrain competition and trade, freight systems will be considered only when they are connected with such problems. A contract, agreement, combination, or conspiracy to arrive at a basing-point or other freight-destination system is a combination in restraint of trade and therefore illegal if it is unreasonably "restrictive of competitive conditions"[30]. It would seem that under most circumstances an agreement to sell solely by certain freight systems would be an illegal restraint because of its effect on free and effective competition between the agreeing parties.

In several Sherman Act cases it has been charged that the collection and distribution by a trade association of information which aided the use of freight systems and other uniform practices was an illegal restraint of trade. In the *Maple Flooring*[31] and *Cement*[32] cases the Supreme Court held that the mere existence of basing-point systems and other uniform practices, in the absence of an agreement, express or implied, is not a violation of the Sherman Act. The government brought the actions under the act, alleging and proving many uniform practices among the manufacturers involved. Since the Clayton Act was not involved, the question of price discrimination by virtue of the basing points was little stressed. The Supreme Court, however, did attempt to justify the basing-point practices and seemed willing to risk the danger of the establishment of uniform price agreements through the mechanism of basing-point systems. In view of the court's language it is difficult to believe that it would condemn those systems under the old Sec. 2 of the Clayton Act[33]. The court stressed the fact that it was the custom of the trade to quote a delivered price and that purchasers would usually buy on no other basis. The court described the basing-point system in the *Maple Flooring* case as follows:

"Through the agency of the secretary of the association a booklet was compiled and distributed to members of the association showing freight rates from Cadillac, Mich., to numerous points throughout the United States to which the finished flooring is shipped by members of the association. It appears from the evidence to have been the usual practice in the maple-flooring trade to quote flooring at a delivered price and that purchasers of flooring usually will not buy on any other basis. The evidence, however, is undisputed that the defendants quote and sell on an f. o. b. mill basis whenever a purchaser so requests. It also appears that the mills of most of the members of the association are located in small towns in Michigan and Wisconsin and that the average freight rates from these principal producing points in Michigan and Wisconsin to the principal centers of consumption in the United States are approximately the same as the freight rate from Cadillac, Mich., to the same centers of consumption. There is abundant evidence that there were delays in securing quotations of freight rates from the local agents of carriers in towns in which the factories of defendants are located, which seriously interfered with prompt quotations of delivered prices to customers; that the actual aggregate difference between local freight rates for most of defendant's mills and the rate appearing in defendant's freight-rate book based on rates at Cadillac, Mich., were so small as to be only nominal, and that the freight-rate book served a useful and legitimate purpose in enabling members to quote promptly a delivered price on their product by adding to their mill price a previously calculated freight-rate which approximated closely to the actual rate from their own mill town".[34]

In the *Maple Flooring* case there was a single basing point at Cadillac, Mich., and all but two members of the association were located in Michigan or Wisconsin (one was in Illinois and the other in New York). On shipments to any distance the discrepancies between freight from the mill and freight from Cadillac were small. Within and near the region in which the mills were located the discrepancies would react against all the manufacturers fairly equally.

One significant statement in the quotation above must be emphasized before passing on to the court's discussion of the legal effects of such a practice. This statement sets forth the fact that the manufacturers involved would quote a price f. o. b. mill whenever a purchaser requested such a quotation. Although the court does not specially stress this fact in the opinion, it may readily be seen that such a practice would be an effective check on producers to make the freight rates quoted from the basing point approximately the same as the actual freight rate from the place of manufacture. Without such a practical check on the difference between actual freight rates and freight rates from a basing point the court might consider any scheme in a much less favorable light.

In the *Maple Flooring* case the government based its criticism of the use of the freight-rate book on the ground that, although the Maple Flooring Assn. did not publish delivered prices in the freight book, the publishing of the freight-rate book and the circulation of tables of estimated cost of flooring effectively enabled the members of the association to arrive at a uniform delivered price by adding to the estimated cost the circulated

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of the industry in relation to consumers as a group, you can not say that the consumers as a group have been forced to pay more freight than they have been saved.

[28] *Id.* at 85-86.

[29] 26 STAT. 209 (1890), 15 U. S. C. A. § 1 (1927).

[30] The "rule of reason" doctrine applies the standard that not *every* combination in restraint of trade is unlawful, but only those which were unreasonable or undue either because of their inherent nature or effect, or because of their evident purpose. *Standard Oil* v. *United States*, 221 U. S. 1 (1911); *United States* v. *American Tobacco Co.*, 221 U. S. 106 (1911); *United States* v. *Terminal R. R. Assn.* 224 U. S. 383 (1912); *United States* v. *Union Pac. R. R.*, 226 U. S. 61 (1912). Thus a burden is placed upon the government to prove that the restraint of trade must be one involving an effective control of a substantial portion of an industry or it will fail in its prosecution. *Standard Oil* v. *United States*, 283 U. S. 163 (1931); *Appalachian Coals* v. *United States*, 288 U. S. 344 (1933).

[31] *Maple Flooring Mfrs.' Assn.* v. *United States*, 268 U. S. 58 (1925).

[32] *Cement Mfrs'. Protective Assn.* v. *United States*, 268 U. S. 58 (1925).

[33] 38 STAT. 730 (1914), 15 U. S. C. A. § 13 (1927).

[34] 268 U. S. 563, 570-571 (1925).

freight rate. It was argued that this was merely a device so that a fixed minimum price would be maintained. The court found that, although the data as to the available cost of flooring, together with the calculated freight rate, could readily be made the basis for a price-fixing agreement, nevertheless, there was no violation of the Sherman Act, since it was not established that the defendants had entered into an agreement to use this material in that manner. It pointed out that the record presented solely the question of whether the use of this material would necessarily result in an unreasonable restraint of interstate commerce. In the absence of a purpose to monopolize or the compulsion that results from a combination or agreement, it felt that an individual could exercise great freedom in his activities without causing a restraint of trade. It was held, therefore, that no restraint had been proved in the *Maple Flooring* case.

The *Cement* case similarly involved the activities of a trade association which compiled and distributed freight-rate books among its members. The members of the Cement Assn. were all located in New York, New Jersey, Pennsylvania, Maryland and Virginia, in which area it was customary to employ four basing points, Universal, Pa., Lehigh Valley, Pa., Hudson, N. Y., and Fordwick, Va. The freight-rate books gave the rate of freight from these four basing points to numerous points of delivery within the territorial area served by the members of the association. These rates were compiled from official tariffs and translated from a rate per ton into a rate per barrel of cement so as to be in more convenient form. The court found that prior to the existence of the association similar books were prepared by individual manufacturers at a greatly increased cost and with a greater possibility of error than existed when compiled on behalf of all the individual manufacturers by the association. In its opinion it stressed the fact that it was the custom in the cement trade to sell cement on a "one-price" or a delivered-price basis even prior to the organization of the defendant association, and that in every instance the basing points were points of shipment from which the larger proportion of the cement in a given locality was actually shipped. The court also found that these freight-rate books were a great convenience in quoting prices accurately and promptly.

The system in and of itself was held not to be a violation of the Sherman Act on the same grounds as were employed in the *Maple Flooring* case. The court also discussed and apparently approved the use of the basing-point system of pricing cement. One of the reasons for such a justification was the history of freight rates applied to competing mills in the Lehigh Valley. There the Interstate Commerce Commission established a blanket rate so that freight charges would be identical for competing mills. The multiple-basing-point system of the cement industry merely amounted to each individual company's equalizing the freight rate applicable to competing mills in a manner similar to the Interstate Commerce Commission's ruling. In the absence of agreement establishing or maintaining such a system, it represented an attempt by each individual to meet competition.

In the *Cement* case the manufacturers may or may not have been willing to sell on an f. o. b. mill price. The opinion makes no mention of what the practice was. The petition, however, sets forth that: "Defendant corporations, without exception, make all sales f. o. b. point of delivery. . ."[35] The decree of the District Court enjoined the manufacturers from agreeing to sell exclusively f. o. b. point of delivery. This decree was set aside by the higher court. This would lead one to believe that the Supreme Court did not consider sales f. o. b. manufacturing point a very decisive factor. Of course, this fact might be very influential, and it must be remembered that the court did not in reality specifically pass on the question.

In the *Maple Flooring* and the *Cement* cases the Supreme Court went so far as to approve specially the gathering and dissemination of information with reference to the transportation costs from the chief points of production, although such information certainly tended to maintain the industry custom of using basing points, on the ground that it was an aid to quick and accurate price quotation[36].

The freight problem in the recent *Sugar Institute* case[37] was complex in form[38], and the District Court found an agreement to adhere to a delivered-price system. Although the defendants waived their assignment of error on this point in order to reduce the issues, the Supreme Court stated that the delivered prices were not arrived at pursuant to an agreement but that the defendants had agreed to maintain the delivered-price system.

The court then found that this "concerted maintenance of delivered prices constituted undue and unreasonable restraint of trade"[39].

In two other Supreme Court cases there were systems involving freight zones or basing points. In *American Column & Lumber Co.* v. *United States*[40], although the members of the Hardwood Lumber Assn. used a basing-point system[41], neither the briefs nor the opinion mentioned it. In *United States* v. *American Linseed Oil Co.*[42], the record disclosed the existence of a zoning system substantially similar to a basing-point system, and Solicitor General Beck laid considerable stress upon its obviously artificial character[43]. The court found an actual agreement in restraint of trade so that it did not have to consider freight zoning *per se*. It did, however, make a passing reference to the existence of a freight-rate zone system[44].

Consent decrees have been entered in two cases involving destination

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[35] Decree of District Court, par. 9 (c).

[36] The court in the *Cement* case recognized that such basing-point systems are an aid to quick, accurate price quotations, when it stated: "Prompt quotation of a delivered price therefore involves the ability to carry out promptly the mechanical process of adding to the mill price the cost of transportation to the point of delivery. Lists of freight rates, in convenient and readily available form, are therefore necessary adjuncts to the quotation of delivery prices for cement." 268 U. S. 588, 598 (1925).

The Federal Trade Commission, however, arrives at the astounding conclusion that delivered prices do not simplify the calculation of freight charges. Thus it states: "The fact that the industry will sell only on a delivery-price basis leads to interminable complications in the calculation of delivery charges." Fed. Trade Comm. *supra* note 1, at 24.

[37] *Sugar Institute* v. *United States*, 297 U. S. 553 (1936).

[38] References to the freight problem (including an agreement not to make allowances for shipping by differential routes) are to be found in the pleadings and decree of the *Sugar Institute* case at the following places: Petition, pars. 20-33, pp. 10-14; Answer, pars. 19-32; Government Brief in District Court, pp. 239-293; Defendant's Brief on the facts in District Court, pp. 202-238; Government Reply Brief in District Court, pp. 182-189; Findings in District Court, pars. 87-131, pp. 38-58, especially pars. 105-113, pp. 45-50; Order in District Court, par. IV, 18-20, pp. 5-6; Defendant's Brief in Supreme Court, pp. 224-246; Government Brief in Supreme Court, pp. 124-171, especially at pp. 139-159; Defendant's Reply Brief in Supreme Court, pp. 90-94.

[39] 297 U. S. 553, 590 (1936).

[40] 257 U. S. 377 (1921).

[41] See Transcript of Record on appeal to the Supreme Court, pp. 33-40.

[42] 262 U. S. 371 (1923).

[43] See Brief for United States, pp. 31 *et seq.*, 142. Note also the references in Brief for Ankeney Linseed Co., pp. 20, 36, 56, and Brief for American Linseed Oil Co., p. 12.

[44] "The United States was divided into eight zones for price quoting; and it was stipulated that each member should quote a basic price for zone number one and should add thereto one,

freight systems. *United States* v. *Bolt, Nut & Rivet Manufacturers Assn.*[45] involved an agreement to use arbitrary basing points for the quotation of freight rates. The consent decree enjoined the agreement[46], and also enjoined "individually . . . charging on account of such freight rates as costs of transportation any amount at substantial variance from the actual cost of such transportation where such charge or charges will result in an unlawful discrimination in price". A consent decree was also entered in the case of *United States* v. *Corn Derivatives Institute.*[47] The petition charged that "The defendants . . . agreed to adopt and have concertedly adopted Chicago, Ill., as an arbitrary freight-basing point from which they compute and charge freight in addition to the quoted prices, regardless of the point from which members actually ship products"[48]. The consent decree is directed solely at an agreement, combination, or conspiracy to use a delivered-price system[49].

In *Standard Sanitary Mfg. Co.* v. *United States*[50] the defendants were enjoined from continuing their agreements to monopolize the restrain trade. In that case one of the elements of the agreement was the division of the United States into eleven freight zones for pricing purposes[51]. In a similar equity action against the Quaker Oats Company an injunction was not secured because of the insufficiency of the proof[52].

There can be little question that in most instances the courts would hold that any agreement to use a freight-destination system was a violation of the Sherman Act. The agency contract of the Appalachian Coal Co., which was sustained by the Supreme Court[53], apparently contemplated that the agency would fix a uniform delivered price for the products of the 136 individual coal producers so that the competition between individual members would not rest on geographical position. The plan, however, contemplated competition between the grade of coal sold by the agency[54]. Basing-point and freight-zone price systems do not violate the Sherman Act unless they are imposed or maintained as the result of an agreement, combination, or conspiracy which unduly restrains trade or tends to create a monopoly.

The Clayton Act.—There have been no cases in the federal courts where the precise question was whether such freight systems amounted to discriminations in violation of the old Sec. 2 of the Clayton Act[55]. The complaint in *In the Matter of United Steel Corp.*[56] charged violation of both the old Sec. 2 of that act and of Sec. 5 of the Federal Trade Commission Act[57]. In view of the Robinson-Patman Act[58], it will be necessary to deal first with cases arising under the old section, and then with the question as to whether the Robinson-Patman Act broadens the law against discriminations so as to cover this question.

The *Maple Flooring* and *Cement* cases, which were treated at length under the discussion of the Sherman Act, give some insight into the problem of the reaction of the courts to the question of the validity of basing-point systems under the Clayton Act.

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two, four, six, seven, eight and eleven cents respectively, for the others." *United States* v. *American Linseed Oil Co.*, 262 U. S. 371, 386 (1923).

[45] District Court for the Southern District of New York, petition in Equity No. 53-383. The decree was entered March 17, 1931.

[46] This decree further provides with reference to the agreement covering freight:

"That the defendants, . . . be and they hereby are perpetually enjoined, restrained and prohibited . . . (f) From agreeing . . . to establish or maintain, or concertedly establishing or maintaining, the basing-point system which includes Pittsburgh, Pa., Cleveland, O., Birmingham, Ala., and Chicago, Ill., as the only base points . . .; (j) From agreeing . . . to refuse or concertedly refusing or concertedly failing to sell or quote prices . . . f. o. b. point of manufacture when requested so to do by the purchaser or prospective purchaser thereof; . . . .

[47] District Court of Illinois, petition filed and decree entered April 6, 1932.

[48] At par. 31. It is further alleged that: "In accordance with a mutual understanding among defendants, each member has refused to quote prices for, or to make sales of, products f. o. b. factory or on any basis other than f. o. b. Chicago; . . ."

[49] Par. 4 of the consent decree provides:

"That the defendants . . . be, and they hereby are, permanently and perpetually enjoined and restrained . . .

(b) From arranging, agreeing, entering into any understanding or otherwise 'acting in concert' . . .

10. To refuse to quote prices for products f. o. b. point of manufacture, or to refuse to sell products at prices to apply at the point of manufacture."

[50] 226 U. S. 20 (1912), *aff'g* 191 Fed. 172 (D. Md. 1911). The zoning system aimed at in this case was primarily a dividing of the country into exclusive selling territories. The petition in equity contained the following allegations of the existence of a freight-zoning system in par. 3:

"The defendants have divided the United States into certain territorial or geographical zones, and by their system of contracts are restricting each jobber in making sales to the zone in which that jobber is located, in other words, the arrangement is such that no jobber is allowed to sell outside his zone."

In the criminal actions of *United States* v. *Standard Sanitary Mfg. Co.*, Indictments Nos. 5163 and 5164 (E.D. Mich.), both filed Dec. 6, 1910, there were allegations to the effect that the defendants had employed freight zones in order to maintain resale prices. The allegations are found in the First Indictment (No. 5163) in the fourth count, at p. 71, and state that the defendants agreed that:

" . . . the said United States was to be divided by the said defendants into eleven territorial zones, the exact details of which said territorial zones are to the grand jurors as yet unknown, except that all the said corporations, partnerships and individuals who were situated in any one zone were to resell at the same prices in said zone said sanitary enameled iron ware in said commerce." There are similar allegations in the Second Indictment (No. 5164) in count 5, at p. 54, and count 6, at p. 77. The criminal actions against the Standard Sanitary Mfg. Co. came before the courts in 187 Fed. 229 (E. D. Mich. 1911). The question involved was whether or not the defendants had secured immunity by testifying on the equity case in Maryland. After a trial lasting six weeks the jury reported a disagreement on Mar. 14, 1912. At a re-trial in February, 1913, the defendants were found guilty and fines aggregating $51,007. were imposed.

[51] Facts with reference to the zoning systems in *Standard Sanitary Mfg. Co.* v. *United States*, 226 U. S. 20 (1912), are set forth in the Government's Brief before the Supreme Court, p. 31 *et seq.*

[52] The case of *United States* v. *Quaker Oats Co.*, 232 Fed. 499 (N. D. Ill., 1916), involved an equity petition filed by the government on June 11, 1913. The petition alleged a combination to restrain and monopolize interstate commerce in oatmeal and by-products therefrom. The petition itself does not set forth the existence of a delivered-price system, but the brief on behalf of the Quaker Oats Co. attempts to justify the existence of such a system on the grounds that it "did not put the wholesaler at a disadvantage in competing with some other wholesaler at a different point in common territory who, by reason of a somewhat lower freight rate, might resell goods at a lower price from the same mill if this arrangement were not in existence." Petition, at p. 71. The practice of the Quaker Oats Co., and at least one of its competitors, involved the maintenance of a uniform freight charge from their points of production to a group of cities, although the actual freight rates to these cities were not uniform. The cities involved were supposed to be places from which wholesale houses were competing against each other for sales in a common territory.

The case was argued before the circuit judges in March, 1916, and decided adversely to the government. An appeal to the Supreme Court was dismissed upon the government's own motion. 253 U. S. 499 (1920).

The case of *United States* v. *Corn Products Refining Co.*, cited and discussed *infra* p. 704, was held to involve a combination in restraint of trade amounting to a monopoly, but the zone system in question was found not to discriminate between purchasers.

[53] *Appalachian Coals* v. *United States*, 288 U. S. 344 (1933).

[54] The basic agency agreement provided that the price of coal would be fixed by the corporate selling agent (Finding of Fact No. 48a). See Brief for Appellant in the Supreme Court, pp. 35-37.

[55] 38 STAT. 730 (1914), 15 U. S. C. A. § 13 (1927).

[56] 8 FED. TRADE COM. DEC. (1924) 1. This case will be discussed *infra* under the treatment of the Federal Trade Commission Act, since it never reached the courts.

[57] 38 STAT. 717 (1914), 15 U. S. C. A. § 45 (1927). The pertinent portions provide: "That unfair methods of competition in commerce are hereby declared unlawful . . . "

[58] *Supra* note 13.

In view of the Supreme Court's language it is difficult to believe that such systems would be held to be discriminatory. In both cases the court went to considerable length to justify the practices of supplying information which would be useful only in the operation of basing points in these industries and points out the logical basis for the existence of such systems. The reasoning applied by the Supreme Court in these cases will apply equally well to freight-zone and delivered-price systems. Thus, the case of *United States* v. *Corn Products Refining Co.*[59] involved a petition in equity to enjoin a combination in restraint of trade. The court, while entering a decree dissolving the Corn Products Refining Co. on the ground that the combination amounted to a monopoly, discussed the contention that the activities of the defendants had resulted in a discrimination in prices. Judge Learned Hand held that a zone system if equitably organized need not result in an actual discrimination in price although it might theoretically appear to do so, saying:

"I can find no evidence of the misuse of the so-called 'zone system', a system which in itself is entirely capable of equitable application. . . . In general, I find the evidence too scanty to justify any finding that the defendants have attempted a genuine price discrimination, though they unquestionably had it in their power to do so".[60]

There could be little doubt that if proceedings had been brought under the old Sec. 2 of the Clayton Act, such freight practices would have been justified in most cases by the proviso allowing a seller to meet competition in good faith[61].

The congressional debates on the Clayton Act reveal no references which could be interpreted as showing an intention to outlaw freight-destination practices. The purpose of Sec. 2 seemed to be to prevent sales below cost or sales at a lower price in the community of their rivals than at other points throughout the country, in order to drive out competitors and thus to achieve a monopoly position. This was well expressed by Representative Floyd of Arkansas in the congressional debates[62].

As further evidence of this fact more comprehensive provisions for Sec. 2 were suggested as amendments; thus "discriminate in price" was proposed to be amended to read "discriminate in price, terms or otherwise", in order to broaden the operation of the section[63]. Another amendment of Sec. 2 was proposed by Senator Clapp of Minnesota[64], providing that anyone "selling a commodity at a lower rate in one section, community, or locality than is charged for such commodity by said party in any other section, community or locality, after making due allowance for the difference, if any, *in the actual cost of transportation from the point of production if a raw product, or from the point of manufacture if a manufactured produce* (product), shall be deemed guilty of unfair discrimination . . ." (Italics added)

The defeat of this amendment to Sec. 2 is a sound ground for asserting that the Congress did not intend to go as far in the statute enacted as the proposed amendment went[65]. It should also be pointed out that congressmen repeatedly referred to the practice of the Standard Oil Co. and other large companies in selling at a uniform price for an entire state, and yet they never once suggested that Sec. 2 would operate to change this situation.

The only statement made in the congressional debates that would lead one to conclude that freight destination systems were not to be protected, even excluding the right to meet competition, is found in one remark of Representative Helvering of Kansas[66], which is explainable on other grounds: ". . . this practice will be absolutely prohibited, for the same price will have to govern in every state, plus, of course, the difference in cost of transportation." It is believed that this statement was not intended to eliminate the possibility of freight-destination practices, but rather to explain that prices might vary to the extent of actual transportation charges.

The wording of the Clayton Act in the old Sec. 2 itself lends support to an argument that there is actual "discrimination" when customers are given prices which make allowance for difference in shipping costs. Sec. 2 acknowledges legal "discrimination" to include ". . . discrimination in price between purchasers of commodities . . . that makes only due allowance for difference in the cost of selling or transportation . . ."[67] The wording is not conclusive, however, in view of the fact that the competitive evil of discrimination as originally envisaged by the Clayton Act lies in the different positions in which customers are placed in their competition with other customers, by the differing treatment accorded them in prices, terms and allowances. Discrimination did not depend upon the difference in net profit or net revenue which the seller realized from his various customers. The result of the trend of the arguments against freight systems is that the equalization of the profit to the seller is essential to the removal of discrimination between customers. Viewed from that angle their argument is not a very compelling one[68]. This real discrimination which exists to-day under freight-destination price systems is based upon the fact that, as a result of a delivered-price system, customers located at or near the place of manufacture or shipment (or in that part of a freight zone nearest the point of manufacture or the basic zone) are deprived of the advantage of such location and often are required to contribute to the cost of transportation of more distant customers, even though such customers frequently are in competition with each other.

Although such freight systems must of necessity result in discriminations when considered from the point of view of pure economic theory, yet the old Sec. 2 of the Clayton Act was aimed at discriminations un-

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[59] 234 Fed. 964 (S. D. N. Y. 1916). The petition in that case does not specifically involve a charge of geographical price discrimination, but merely alleges the existence of an illegal combination. It then proceeds to specify certain alleged unlawful and unfair acts of the defendants. Even in this specification no mention is made of the fact that zones amounted to unfair competition.

[60] *Id.* at 994.

[61] The proviso states: "*Provided*, That nothing herein contained shall prevent . . . discrimination in price in the same or different communities made in good faith to meet competition." 83 STAT. 730 (1914), 15 U. S. C. A. § 13 (1927).

[62] "The provision is in plain language and seeks to prevent dealers from lowering the price of commodities in different sections and communities by unfair discrimination with the intent and purpose to destroy, ruin, or injure the business of a competitor. That is a recognized evil extensively practiced by great and powerful concerns to drive out competition and destroy competitors, which results to the serious detriment of the general public, and has been demonstrated to be a most effective means in acquiring a monopoly. It does that and nothing more, and is not intended to do anything more." 51 CONG. REC. 9158 (1914). See also *id.* at 9260, 9263-9264, 9552, 9595, 14208-14209, 14228, 14250.

[63] *Id.* at 9265. Note the amendment by Representative Morgan of Oklahoma, which is set forth in full together with comments thereon.

[64] *Id.* at 14252-14253, 14597-14598.

[65] *Id.* at 14597.

[66] *Id.* at 9184.

[67] 38 STAT. 730 (1914), 15 U. S. C. A. § 13 (1927).

[68] *American Can Co.* v. *Ladoga Canning Co.*, 44 F. (2d) 763 (C. C. A. 7th, 1930), *cert. denied*, 282 U. S. 899 (1931), held that Sec. 2 of the Clayton Act applied to a discrimination which gave to one consumer a price advantage in a material factor which was not given to competing consumers. See also *Van Camp & Sons Co.* v. *American Can Co.*, 278 U. S. 245 (1929).

reasonable in extent which tended to create a monopoly. It was certainly not directed at old practices which were reasonably necessary to the carrying on of efficient business and which did not tend to create a monopoly, or to practices which were adopted in good faith to meet competition. It is easily conceivable that some freight systems might be of such an artificial and unreasonable nature that they could not be sustained on any ground except that they were necessary to meet competition.

The Robinson-Patman Act.—Heretofore, one of the chief bases for justifying delivered-price systems has been found in that part of the old Clayton Act which is now repealed[69], at least in its old form, and which specifically recognized the right to quote different prices in good faith for the purpose of meeting competition. The Robinson-Patman Act[70] now raises a question as to whether such destination prices are permissible or whether they constitute unlawful price discriminations[71].

The Robinson-Patman Act as finally approved contained no special reference to the freight situation. It is significant, however, that a number of the proposed amendments to the old Clayton Act specifically covered this controversial point[72]. Thus the Patman Bill, as reported by the House, provided "That the word 'price', as used in this Sec. 2, shall be construed to mean the amount received by the vendor after deducting actual freight or cost of other transportation, if any, allowed or defrayed by the vendor"[73]. The Utterback Bill contained similar language[74]. It is apparent that such a provision would probably eliminate this problem provided that a person could not in good faith meet competition, since no discriminations in price were allowed by virtue of the other provisions of the act[75]. There can be no doubt that such was in fact the intent of proponents of these provisions[76].

The Congress deliberately rejected the attempt to prohibit systems of selling upon a delivered-price basis either throughout the entire United States or by zones. The proposal provoked considerable opposition[77], especially among farm leaders as well as from a number of industries. The House Judiciary Committee eliminated this provision with the statement that otherwise the act could not be passed[78]; and a number of congressional leaders expressed their opinion that the new law did not affect the basing-point system[79]. In submitting the conference report on the Robinson-Patman Bill Representative Utterback was careful to define "discrimination" so as to avoid much of, if not all, the delivered-price controversy. He said,

"In its meaning as simple English a discrimination is more than a mere difference. Underlying the meaning of the word is the idea that some relationship exists between the parties to the discrimination which entitles them to equal treatment, whereby the difference granted to one casts some burden or disadvantage upon the other. . . . But where no such relationship exists, where the goods are sold in different markets and the conditions affecting those markets set different price levels for them, the sale to different customers at those different prices would not constitute a discrimination within the meaning of this bill".[80]

When the delivered-price provision of the Patman Bill was eliminated, in order to assure the passage of the remainder of the bill, a new one was introduced, the Wheeler Anti-Basing-Point Bill[81], which was intended to cover completely the entire subject of freight allowances. As a result of this legislative history it may be argued with some considerable degree of effect that the amended Clayton Act was not intended to broaden the operation of the old Sec. 2 on freight practices, and that the law does not require the measurement of price discrimination in terms of "mill net" or "factory" prices. "Price" will probably be construed as the amount paid by the buyer. An examination of the statute, however, reveals that without this legislative history a court might have listened more attentively to the argument that there was discrimination, in view of the apparent elimination of the general proviso which allowed a seller to meet competition in good faith.

In view of the proviso in Sec. 2 (b)[82] allowing a seller to meet an equally low price of a competitor, it has been suggested that the amended statute would require manufacturers to sell on some sort of basing-point system according to which the factory (or warehouse) of each competitor could be used as a basing point with the competitor's price at his factory

[69] 38 STAT. 730 (1914), 15 U. S. C. A. § 13 (1927). See *supra* note 60 for the pertinent proviso.

[70] *Supra* note 13.

[71] Many trade associations whose members manufacture and sell diverse types of products have compiled questions with reference to the effect of the new Sec. 2 of the Clayton Act. Considerable interest was shown in the question of whether the new law affected the delivery charges. Sellers wanted to know whether the act required uniform freight terms, or whether it required selling on an f. o. b. mill basis. The question most often asked was: "Is selling on a delivered-price basis to customers located at unequal distances from the point of supply prohibited?"

[72] It is difficult to ascertain the origin of the Wheeler and Utterback Anti-Basing-Point Bills, *supra* note 2, but they seem to express ideas that have long been promoted by the Federal Trade Commision. They may have developed as the result of the controversy between the N.R.A. and the Federal Trade Commision in regard to the operation of the code for the Iron and Steel Industry (see Fed. Trade Com. report on this subject, *supra* note 8) during which time the commision strenuously attacked the basing-point system in the steel industry. Considerable impetus was probably given to these bills by the activities of municipal purchasing agents, and such officials as Secretary Ickes. See NEW YORK TIMES, April 10, 1936, p. col. 2, as to Boulder Dam bids on wire and cable. It is insignificant that the items bid on in this incident were patented products covered by license agreements which compelled the quotation of a uniform price, since the item represents the present attitude of some government officials.

[73] H. R. 8442, 74th Cong., 2d Sess. (1936), as reported March 31, 1936, p. 7, lines 20-23. This definition of price was eliminated on the floor of the House, 80 CONG. REC. 8223-8224 (1936).

[74] H. R. 10486, 74th Cong. 2d Sess., introduced January 22, 1936, 80 CONG. REC. 2889 (1936).

[75] It is apparent that the purpose of the provision was to prevent a company from quoting a destination price to one customer which, after deducting freight rate, would result in a net price to the seller which was different from the net price received in a sale to a different buyer. It should be noted, however, that one of the items of proof which would have been required under this bill was that discrimination must be shown "substantially to lessen competition or tend to create a monopoly in any line of commerce, or to injure, destroy, or prevent competition with any person who either grants or receives the benefit of such discrimination, or with customers of either of them." H. R. REP. No. 2287, 74th Cong., 2d Sess. (1936) 14.

[76] The report of the House Judiciary Committee on the Patman Bill, H. R. REP. No. 2287, 74th Cong., 2d Sess. (1936), at p. 14, states with reference to this provision: "In effect, this provision of the bill is designed to to put an end to price discrimination through the medium of the basing-point or delivered-price system of selling commodities. It will require the use of the f. o. b. method of sale."

[77] Statement by Citron, 80 CONG. REC. 8223-8224 (1936); see also *id.* at 8122-8123 and 8126-8127.

[78] Statements by Boileau, 80 CONG. REC. 8122-8123 (1936), and *id.* at 7760.

[79] Statement by Borah, 80 CONG. REC. 9903-9904 (1936), and *id. at* 8223-8224, 8122-8123, and 8126-8127.

[80] CONG. REC. 9416 (1936). There are other expressions to the same effect at *id.* 8223-8242.

[81] *Supra* note 2.

[82] The pertinent proviso is:

"Provided, however, that nothing herein contained shall prevent a seller rebutting the *prima facie* case thus made by showing that his lower price or the furnishing or services or facilities to any purchaser or purchasers was made in good faith to meet an equally low price of a competitor, or the services or facilities furnished by a competitor." 49 STAT. 1526, 15 U. S. C. A. § 13 (b) (Supp. 1936).

being the basing-point price. Such an interpretation depends on the statute allowing a seller to discriminate in price among purchasers from him, provided he is meeting an actual price quoted by a competitor[83].

It is felt that in view of the fact that the Congress eliminated a specific provision covering freight applications before passing the amended Clayton Act, and also in view of the attempt to cover this subject by a separate specific bill, a court would probably hold that such freight systems were not discriminatory *per se*, but that each case must stand on the particular facts involved in any given industry.

The Federal Trade Commission has recently issued a complaint against the "Birmingham-plus" system employed by certain cast-iron-pipe manufacturers[84]. One of the counts in this complaint charges that an agreement to utilize and the utilization of a basing-point system amounts to a violation of the Robinson-Patman Act. We may expect, after a decision in this case, that the question of whether or not a basing-point system is illegal under the Robinson-Patman Act will be determined.

It should be pointed out that if it were held that the Robinson-Patman Act were applicable to destination-freight systems, they would probably not be illegal *per se*, but a question of fact would arise in each specific case upon the question of whether the buyers were in competition with other buyers from, or competitors of, the seller. The discrimination would, therefore, be actionable only when some one is hurt in his business or, in the language of the act, "where the effect of such discrimination may be substantially to lessen competition or tend to create a monopoly in any line of commerce, or to injure, destroy, or prevent competition with any person who either grants or knowingly receives the benefit of such discrimination, or with customers of either of them"[85]. If no person or no line of competition is hurt, then the act is not illegal. Of course, where buyers are in different markets it is not likely that anyone will be injured by any such freight-price systems. In addition a seller may still meet competition at destination, and thus such freight systems may still be used under proper circumstances.

Some arguments may be made that no discrimination whatsoever exists in the case of a flat delivered-price system in view of the uniformity of price, and apparently these arguments would apply in the zone situation only if the buyers in one zone were not in competition with the buyers in another zone, or if the difference in zone price is a function of, or proportional to, the actual freight rate[86].

The legislative history of the Robinson-Patman Act and the proviso apparently condoning the meeting of a price of a competitor will probably be sufficient to justify freight-destination price systems under the act. It must be remembered, also, that the delivered-price and analogous problems do not arise in any form where "competition", as defined in the act, is not affected.

Before the Trade Commission.—In 1924 the Federal Trade Commission ordered the United States Steel Corp.[87] and others to cease and desist from selling its rolled-steel products at a Pittsburgh price plus freight from Pittsburgh, on the ground that this practice constituted a violation of Sec. 2 of the Clayton Act, and that it was an "unfair method of competition" under Sec. 5 of the Federal Trade Commission Act[88]. The reasoning of the commission was that a manufacturer, by adopting such delivered-price policies, was "unfairly" discriminating among customers[89]. It was found as a fact that the discriminations under "Pittsburgh-plus" were not made for any of the purposes permitted by the Clayton Act, and the commission specially stated that "the prices thus made were not and are not made in good faith to meet competition in different localities and communities"[90]. It also found in reference to "Pittsburgh-plus" prices that "Pittsburgh-plus" adds millions of dollars each year to the price paid by steel users outside Pittsburgh, which of course, must be eventually paid by the public"[91].

Commissioner Gaskill wrote a vigorous memorandum of dissent in this action, in which he found no legal basis for the cease-and-desist order. He stated that he felt that the question was one of legislative correction[92], and that the Federal Trade Commission was going beyond the jurisdiction granted to it by the Congress. The dissent is also based on the theory that the Federal Trade Commission Act does not establish a standard of absolute freedom of competition, but allows the observance of sound economic principles[93].

The respondents never attacked the validity of the commission's cease-and-desist order, but issued an announcement that, without conceding the validity of the order, they had determined to conform thereto in so far as practicable. As a matter of fact even before the order was issued the United States Steel Corp. had found it inadvisable to adhere strictly to the Pittsburgh basing-point system. Birmingham, Alabama, and Chicago were added as basing points. Additional

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83 There was discussion in both houses as to the effect of the new proviso compared with the old. See Senator Nuys' remarks, 80 CONG. REC. 9903-9904 (1936), and Representative Utterback's, *id.* at 9418. They both maintain that the present proviso is a rule of evidence, and does not affect the substantive provisions of the act. This view is difficult to understand, and will have to be clarified by the courts. See also Fed. Trade Com., *Data in Connection with the Robinson-Patman Act* (1936) 22-24.

84 *In Matter of Cast Iron Pipe Association.* Fed. Trade Com. Docket No. 3091 (complaint issued March 26, 1937), the complaint in two counts charges, first, that the respondents agreed to employ a "single-point system" of pricing which was operated on a Birmingham-plus basis; and second, that this agreement and the practices pusuant thereto resulted in price discrimination under the Robinson-Patman Act.

The theory on which the "Birmingham-plus" system is attacked is set forth in Count II, par. 6, where it is alleged that delivered prices are not the actual prices received by respondents. This complaint is, therefore, based on the theory that in order to comply with the Robinson-Patman Act each manufacturer must inaugurate a pricing system with a single base price at his point of manufacture (or at his warehouses), to which would be added the actual freight to the destination of each customer.

85 49 STAT. 1526, 15 U. S. C. A. §13 (a) (Sup. 1936).

86 See Kavits, *Analysis of New Section 2 of Clayton Act made for National Paper Trade Assn., Inc.* NEW YORK TIMES, July 20, 1936, p. 22 col. 1.

87 *Matter of United States Steel Corp.*, 8 FED. TRADE COM. DEC. (1924) 1.

88 *Supra* note 56.

89 In *Matter of the United States Steel Corp.*, 8 FED. TRADE COM. DEC. (1934) 1, 20, the Findings of Fact, in par. 6 (h), state this discrimination in these words: "The respondents, in selling their respective steel products from their mills outside Pittsburgh at Pittsburgh-plus prices discriminate among the customers of the *same mill*. In the case of two steel users buying steel from the same mill outside Pittsburgh, that steel user whose plant has a less freight rate from Pittsburgh secured a less price from the respondent than his competitor whose freight rate from Pittsburgh is greater. In other words, the actual freight rates from the producing mill to the customer's plants do not determine the difference between the delivered prices paid by customers buying steel from the same mill."

90 *Id.* at 38.

91 *Id.* at 35.

92 "If the economists are right, the requirements of the situation will be met only by a legislative recognition of the necessity for a more exact statement of the scientific relation between business and economics and the declaration of that relation in the form of a law of general application." *Id.* at 65.

93 *Id.* at 62.

basing points for different steel and iron products were added, so that Cleveland, Worcester (Mass.) and Duluth were added for wire products. Steel tubes had basing points at Pittsburgh, Lorain and Youngstown, O., Wheeling, W. Va., and Chicago.

Although products were no longer quoted solely on a Pittsburgh base, it appears that the delivered price generally quoted was in fact equivalent to the old "Pittsburgh-plus" price. Thus, while the mechanics of "Pittsburgh-plus" were generally modified, prices persisted at levels progressively higher as the distance from Pittsburgh increase, and this although steel costs at both Birmingham, Ala., and Gary., Ind., were considerably below costs at Pittsburgh.

It is rather difficult to understand why the commission has allowed the steel industry to continue such practices unmolested after its entry of the cease-and-desist order. It has been well aware of the workings of the steel basing-point systems and has published numerous pamphlets concerning this subject[94]. It has issued four complaints against delivered-price practices in other industries. One complaint was dismissed[95], a second was settled by a consent cease-and-desist order[96], and the other two are still pending[97]. The commission has also considered a basing-point system in a case alleging a Sherman Act conspiracy[98].

In connection with proceedings before the Federal Trade Commission it is good to remember that the jurisdiction of that body is not entirely limited to violations of the Sherman and Clayton Acts, provided the activities are "unfair methods of competition"[99]. In the main "unfair methods of competition" have been limited to embrace only violations of provisions of law or already established common law rights. The *Beech-Nut* case[100], however, goes beyond these limits, but subsequent cases have not extended[101] it beyond the original scope of the decision, which held that complex systems for checking upon a failure to sell at suggested resale prices may go so far beyond a simple refusal to sell to price-cutters that they are illegal, and that such individual policing or check-up systems are illegal. In spite of the lack of authority on this situation, it is believed that the courts might well permit the commission to extend its activities to include prosecutions of individual discriminations which, though legal under the Clayton Act, nevertheless amount to unfair methods of competition and clearly evade the intent of the anti-trust laws though not contrary to their specific provisions.

The Federal Trade Commission has expressed itself against basing-point and delivered-price systems on numerous occasions[102]. Its expert economic witnesses[103] are rabid against all freighting systems which are not based on the actual freight rate from the place of manufacture to the point of consumption. The commission is probably correct in believing that a delivered-price policy results in an economic discrimination among customers. Thus some customers must purchase freight that they do not use or they must pay a higher initial cost, depending upon from which angle the process is viewed. This discrimination, of course, becomes less and less as charges made for freight approach actual freight costs.

Even assuming that such freight systems were "unfair methods of competition"[104], by virtue of *Federal Trade Commission* v. *Raladam*[105] the commission can not proceed against any freight practices as unfair methods of competition unless proof can be given that such practices appear to threaten substantial injury to, or in fact do lessen, competition. The *Raladam* case would be a complete defense if there were no competitors, and it seems to offer a complete defense if all the companies in an industry voluntarily follow the same practice; no attack is open unless it is proved that: (1) there is an agreement, or (2) there is a discrimination which tends to create a monopoly.

Under most circumstances it would be difficult to make out a case where delivered-price practices were "unfair methods of competition" unless they were clearly in no way reasonably related to freight costs and were not necessary to the meeting of competition, or unless they had in fact resulted and were resulting in a lessening of competition.

Conclusion.—The *Maple Flooring* and *Cement* cases were treated at length because they represent the only times that freight destination questions have ever been seriously discussed by the courts. In the future the courts might hold other freight-destination systems unreasonable discriminations and make a distinction between the basing-point systems used in the maple-flooring and cement industries and those developed in other industries. From the Supreme Court's opinions in those two cases it is ap-

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[94] Fed. Trade Com. reports listed *supra* note 8. See also Fed. Trade Com. *Study of the Zone-Price Formula in the Range Boiler Industry*, 1936.

[95] Fed. Trade Com. complaint Docket No. 1461, which charged that sales of range boilers were based "on a delivered and fixed lump sum basis . . . " was dismissed without reason given, May 1, 1931.

[96] In *Matter of National Electrical Mfrs'. Assn.* Docket No. 2565, the original complaint was issued Sept. 26, 1935, the amended complaint on Nov. 16, 1935, while the consent cease and desist order was entered Dec. 29, 1936. Both complaints charged an agreement to use a delivered-price system. The findings of fact restated the allegations of the original and amended complaints with reference to delivered price, and the cease-and-desist order provided:

"It is FURTHER ORDERED that said respondent corporations . . . cease and desist . . . from doing and performing, by agreement, combination or conspiracy . . . the following acts and things: . . . (7) Refusing to sell any buyer who so elects at a price calculated f. o. b. point or place from which the goods purchased are actually shipped; (8) Requiring that customers purchase only on a delivered-price basis, whether in the form of a single delivered price throughout the United States or throughout each of any number of price zones; . . . "

[97] *Matter of Cast Iron Pipe Assn.*, cited and discussed *supra* note 83, and *Matter of the Water Works Valve and Hydrant Group* Fed. Trade Com. Docket No. 2958 (complaint issued Oct. 29, 1936, and amended Nov. 16, 1936). The latter case alleges that the respondents have " . . . agreed to divide . . . and have divided the United States into zones, in which zones the said respondents have by agreement fixed and maintained . . . enhanced uniform delivered prices . . . " Most of the respondents filed an answer on Feb. 1, 1937, consenting to the entry of an order to cease and desist from any such agreement.

[98] In *Matter of North Dakota Wholesale Grocers Assn.*, 9 FED. TRADE COM. DEC. (1925) 266, the complaint charged the association with entering into an agreement or understanding to fix uniform prices at which its members were to sell their products. The complaint itself did not charge an agreement to use a basing-point or freight-zone system. The commision found, however, that the respondents had entered into an agreement to fix and maintain prices, and that pursuant to said conspiracy they had agreed that sugar should be sold upon a common basing-point system. Price cards showing the agreed prices and freight books showing the freight to be added to the base price from the common basing-point were distributed among the respondents.

The commission entered an order compelling the respondents to cease and desist from agreeing upon and maintaining uniform selling prices. The order did not specifically direct the respondents to cease and desist from using a basing-point system. The reason, perhaps, for not having done so probably is that the commission felt that in the absence of an agreement to fix and maintain prices the basing-point system would cease to exist.

[99] *Federal Trade Commission* v. *Beechnut Packing Co.* 257 U. S. 441 (1922).

[100] *Ibid.*

[101] The only apparent attempt to extend the *Beech-Nut* case to other factual situations was defeated in *Federal Trade Commision* v. *Western Meat Co.*, 272 U. S. 554 (1926), on the very special grounds that the commission was specifically authorized to enforce Sec. 7 of the Clayton Act and hence could not go beyond the scope or remedies therein provided for.

[102] *Supra* note 8.

[103] Fetter, *op cit. supra* note 11.

[104] Federal Trade Commission Act, § 5, 38 STAT. 719 (1914), 15 U. S. C. A. § 45 (1927).

[105] 283 U. S. 643 (1931).

parent that the basing points were used for the purpose of facilitating the calculation of delivered prices and that they enabled manufacturers to know what mill-base price they would have to set in order to quote a competitive price at any given destination.

Whenever the points of manufacture are closely concentrated and the locations of basing points are roughly central, and no single manufacturer is placed in a particularly advantageous competitive position, then the discrimination involved does not tend substantially to lessen competition, restrain trade, or create a monopoly. In addition, when the points of production are comparatively close to the points of actual shipment there is no systematic discrimination between customers. Since the chief consideration in both these cases was the legality of open-price trade associations, it has been contended that the court's apparent conclusion that there was no substantial discrimination is an ill-founded dictum based on a superficial analysis of the nature and possible effect of basing-point systems. Granted, however, that such policies are discriminatory, it does not follow that they can *ipso facto* be ruled out. It would have to be a discrimination so as "substantially to lessen competition or tend to create a monopoly"[106]. The purpose and effect of the freight-destination policies in most industries does not seem to have resulted in monopoly, though it would seem that a complete uniformity in freight policy would eliminate geographical location of factories as an element in the competition between manufacturers. The Supreme Court has held[107] that not all price discriminations are illegal. Such cases suggest the possibility of sustaining a freight-destination policy, although discriminatory in character, on the ground that it was a necessary device in order to meet competition. A seller could probably also justify his practices if he followed those of the industry leader, since the mere fact of following the leader does not make the practice an illegal restraint of trade[108]. If, however, an actual agreement was proved among the sellers, there could be no justification of the practice on such grounds, or on any grounds except as indicated above in the discussion of the Sherman Act.

It is impossible even to outline the many factual variations which bear on the reasonableness of freight-destination systems. Since no authority exists on the validity of one system as compared with another, it may be safely assumed that the courts will examine with diligence the reasonableness of any freight-destination systems which come before them.

The difficulty of predicting the effect of the Robinson-Patman Act on this problem should be apparent. It should first be realized that the definitions of "price" in the original Patman and Utterback Bills were not designed to eliminate the discriminations covered by the original Clayton Act. They were designed primarily to equalize the net profit or net revenue which a seller actually realizes from his various customers. Before a court should construe the Robinson-Patman Act to reach this result it should certainly re-examine the basis of the act and also consider the possible effects of an interpretation which condemns freight-price systems. If such an interpretation were made, it would result in many instances in destroying the equality of price to which groups of customers have been accustomed. The gain of one customer would certainly be the loss of another. It is unsound to examine delivered-price practices entirely from the point of view of whether or not one system or the other would have been preferable from the beginning; the fact must be faced that many businesses have been built up upon the principle of some freight-destination system, and to disturb it now would risk such a vast dislocation of the normal channels of seller and customer that any predicted countervailing advantages should be closely scrutinized.

The answer to the question of whether there is substantial or unfair discrimination among competitors must rest in a large measure on the facts presented in a given case. It is safe to say, however, that the Supreme Court has dealt sympathetically with freight-destination systems which were based on the stable custom of an industry and which appeared reasonable and justifiable on their facts. If the sole purpose of a freight-destination system is artificially to extend the area in which a group of factories can profitably operate, the system is open to some criticism; but if its purpose is solely to meet competition in good faith, it is a reasonably justifiable business practice. The line between these two purposes is one which would be almost impossible to draw even in a concrete case.

[106] Clayton Act, § 2, 38 STAT. 730 (1914), 15 U. S. C. A. § 13 (1927).

[107] *Fairmount Creamery Co.*, v. *Minnesota*, 274 U. S. 1 (1927), which held that state anti-trust legislation could not forbid price discrimination made in good faith to meet competition, and that a purchaser could not be prohibited from paying a lower price in communities where competition did not exist and higher prices where it existed. Cf. *Central Lumber Co.* v. *South Dakota*, 226 U. S. 157 (1912), where it was held that a state could regulate discriminating sales made for the purpose of destroying competition.

[108] *United States* v. *International Harvester Co.*, 274 U. S. 693 (1929).

Phosphate Shipments Show Sharp Rise

Midyear reports forecast a 20-per cent. increase in shipments of phosphate rock during the current year as compared with 1936 when they aggregated 3,351,857 long tons valued at $11,406,132. For the first six months of 1937 the quantity of phosphate rock sold or used in the United States, as compiled from reports to the Bureau of Mines, was 1,930,582 tons valued at $5,922,332. Comparable figures for the corresponding period of last year are not available but production of superphosphate, by far the leading use for phosphate rock, advanced 48.1 per cent. and raw rock shipments for the first half year are 15 per cent. more than one-half those for the calendar year 1936. It is gratifying to note, too, that shipments during July and August continued at a very high rate and business booked by several companies for September ran well ahead of last year.

The value of shipments during January to June, 1937, as reported to the Bureau of Mines, averaged slightly less than the average of 1936 sales, $3.07 against $3.40. This average, however, is a composite figure covering many different grades of rock and both export and domestic business. Domestic prices and export prices both remain unchanged at the same levels as last year but the proportion of export to domestic business declined. Partly because the average grade is higher and also because prices in foreign currencies were never scaled down to the devaluation of the dollar, the average price per ton for phosphate rock shipped abroad is higher than the average of domestic sales. Exports reported by producers for the 6-month period of 1937 aggregated 413,030 long tons valued at $1,661,742 and represented only 21 per cent. of the total tonnage shipped, compared with 35 per cent. of the total shipments during the whole of 1936. In 1937 23 per cent. of the tonnage was for consumption by the producer or affiliated companies and 56 per cent. was shipped to other domestic consumers. During 1936 affiliated plants accounted for only 18 per cent. of the total tonnage and other domestic consumers took 47 per cent.

By PAUL M. TYLER
Chief Engineer, Nonmetal Economics Division,
U. S. Bureau of Mines

MICA—A MODEST MINERAL

An open-cut mica mine in North Carolina.

BIG industries grow from little industries like oaks from acorns, but less obvious is the extent to which big industries depend for their existence on little industries that supply some vital material. A surprising number of such key industries are mining enterprises, insignificant in size but tremendously important to our economic welfare and contributing materially to the comfort and convenience of our living. Mica mining, for example, hardly rates as an industry. Rarely does it afford direct employment in the United States to as many as 250 persons, and the mica mine that works steadily throughout the year is an exception. The value of the output of sheet mica, as reported by the United States Bureau of Mines, frequently falls below $100,000 a year. Including imports but excluding scrap suitable only for grinding, the quantity of mica used in the United States, even in predepression times, averaged less than 3,000 tons a year valued at less than 2½ million dollars. Candy boxes cost more than that; and we spend almost three times as much for candles, more than ten times as much for buttons, and 300 times as much for butter. In 1927, a fairly normal year, chewing-gum manufacturers alone valued their product at $62,001,320. It is thus evident that by any of the ordinary yardsticks the mica industry is a small one. Now that it no longer is used extensively for stove windows or lamp chimneys, the average man never gives it a thought. Like so many minerals, it keeps out of the spotlight and gets none of the popular credit for the contributions it makes to our well-being. How many realize when they snap on the radio or almost any household electrical appliance—toasters, flat irons, curling irons, coffee percolators, and water heaters—that these devices would function imperfectly or not at all if they did not contain mica? It is no exaggeration to say that our present-day use of electricity in all forms would be impossible without it. Dynamos, motors, in fact virtually all the billions of dollars worth of electrical manufactures would have to be redesigned if our supplies of mica were seriously diminished, and experts agree that it is doubtful whether any such redesign would permit them to operate efficiently without mica. For decades substitutes have been sought in vain, and nothing yet has been glimpsed, even in the laboratory, that looks promising. Take away our mica in wartime, and our power plants would be idle. No welds could be made electrically. Our munition plants would suffer. Our airplanes could not fly. Trucks and ambulances would stand still, and wireless communication would be impossible.

Mica has been produced in a dozen states, but only three, New Hampshire, North Carolina, and South Dakota, have been large producers. Of these, South Dakota was really important only for a few years during the first decade of the present century. Virginia came into some prominence during the World War, and recently Connecticut, usually not considered a mining state, has contributed about one-fourth of the country's mica output. In North Carolina and New Hampshire, however, mica mining has persisted year after year, the mica sometimes coming as a byproduct of feldspar but also in most years representing the principal product of one or more properties. Colorado and New Mexico contain large deposits of mica, but much of the Western material is so "ruled" that it splits up into ribbons or is otherwise flawed or rumpled so that very little can be recovered as sheet or split mica. These states afford a large potential supply of scrap mica, but at present there is no shortage of scrap mica because a good deal of waste is made at the sheet-mica mines, more scrap comes as a byproduct of feldspar mining, increasing quantities are recovered from washing china clay, further quantities are obtained by grinding mica schist, and finally there are trimmings at factories where sheet mica is cut or punched into the desired forms. Whereas sheet mica is worth all the way from 30c to several dollars a pound, according to size and color, scrap mica is worth as little as $6 a ton, rarely as much as $20 a ton or 1c per lb.

In 1936 the domestic output of uncut sheet mica, according to reports of producers to the Bureau of Mines, totaled 1,319,233 lb. valued at $203,879 compared with a maximum of 2,476,190 lb. valued at $283,832 in 1910. In 1918 the value of the output of American mica mines jumped to a peak of $731,810, but the quantity was only 1,644,200 lb. Scrap-mica production, usually less than 5,000 tons yearly before the World War, later fluctuated between 5,000 and 10,000 tons, and recently has been growing rapidly, reaching 20,955 tons valued at $260,594 in 1936.

Scrap mica is ground either wet or dry. The wet-ground product is rather expensive, formerly selling at over $100 a ton and currently worth $60 or more. It is used in decorative inks and wallpaper finishes. The wallpaper industry takes about 2,000 tons a year, but few people realize that the silvery sheen effects now so admired are caused by tiny particles of the same mineral that used to be employed chiefly to reveal the cheery firelight in old-fashioned coal stoves. A fair amount of wet-ground mica is employed in the rubber industry for various purposes, including dusting the interior of molds in which automobile tires are fashioned, and smaller quantities are used for paint, lubri-

cants, and axle grease and in special plastic compositions.

Notwithstanding the ease with which it can be split into films, mica is a difficult material to grind. The flakes are elastic and have to be shredded. Dry grinding is much quicker and cheaper than wet grinding; and, although dry grinding fails to preserve the sheen, the consumption of dry-ground mica is many times larger than that of the wet-ground product. Best known of its many uses perhaps is the coarsely ground "artificial snow" used as Christmas tree decoration and in motion-picture studios. The main users are roofing-paper manufacturers. The mica prevents sticking of the sheets in the roll, improves the appearance, and contributes some measure of fire resistance. Only a small amount of ground mica is used for molded electrical insulation.

Dry-ground mica can be bought for $15 to $20 a ton, and among its miscellaneous uses are paint manufacturers, lubricants, annealing steel, concrete and foundry facings, pipe-line enamel, and architectural plastic products.

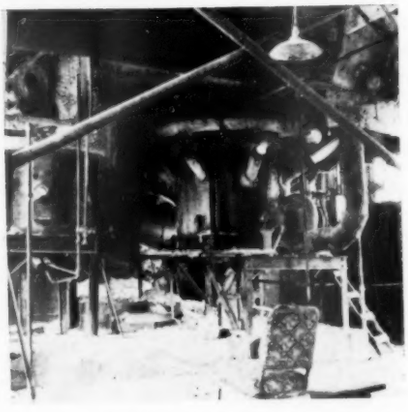
Although the United States is the world's largest consumer of mica, it produces normally only 15 to 35 per cent. of its requirements of sheet mica larger than about 1½ by 2 in. and less than 5 per cent. of its requirements of splittings. The bulk of the production from domestic mines is of course scrap, but we produce almost enough punch and circle mica—large enough to use for making washers and small radio stampings—to meet our needs. Our principal importation is splittings, of which we consumed in 1936 more than 3,500,000 lbs. Virtually all this material has to be imported, nearly 90 per cent of it from India, most of the remainder coming from Madagascar with small contributions from Canada.

These splittings consist of films mostly .001 in. thick or even thinner made from blocks of mica too small to use for sheet. Splittings must be at least 1 sq. in. in area, reasonably uniform in thickness, and free from all inclusions of other minerals. No way has been found economically to produce mica splittings by machinery. Our supply comes mainly from India not only because mica is abundant there, but also because the work has to be done by hand and hence only where labor costs little. Indian splittings are made mostly by children. The children not only work cheaper but have a delicacy of touch that allows them to do the splitting faster and better. Loose splittings made from irregular pieces of mica are small and characteristically irregular in outline. They are used in making built-up mica or so-called mica beard or "micanite". A rather large proportion of the built-up mica manufactured in the United States is used by companies that make it, as, for example, Westinghouse and General Electric, in their production of motors, generators, and all sorts of electrical equipment. Several other companies, about equally prominent as producers, are not so integrated, although they generally carry their fabricating processes beyond the point of making board, tape, etc. Most of them manufacture tubing, tape strips, V-rings, and—most important of all from a quantity standpoint—segment plates for the commutators of generators, and starting motors of automobiles.

In principle, the process of making built-up mica is simple. Layer upon layer of the irregularly-shaped films are assembled on a bottom piece of paper or fine-mesh screen and held together with a binding material or shellac or glyptol varnish, which is sprayed or painted over each layer of splittings as formed until the desired thickness is attained—varying up to ⅝ in. Individual plates, usually 36 in. by 36 in., are put into an oven, heated at 250 deg. to dry the varnish, and then inspected in a darkened room over a strong light or occasionally using X-rays. Imperfections or thin spots are touched with additional binder or covered with additional splittings as required; or if it cannot be repaired, the defective part is cut out. The sheets are then put in a press, where they are subjected to a pressure of a thousand pounds per square inch at about 300 deg. for several minutes and then chilled quickly. Upon leaving the press, the sheets are milled or sanded and finally ground perfectly smooth and to exact thickness. In several plants part of the output is made by more mechanized methods; the flakes of mica, instead of being dabbed on by hand, are fed to a "snowing" tower onto a revolving drum or belt, often a moving suction screen, upon which one or at most three layers are built up.

An Indiana Mineral-Wool Plant

The mineral-wool plant of Ellis Fish, Inc., near Bedford, Ind., in the famous Indiana limestone-quarrying district.



Wool being blown from one of the cupolas into the cylindrical door which leads into the wool room.

A view of the two cupolas from the charging floor where the stone and coke are loaded.

Roller compressing the mineral wool. In the background is the granulating machine.

By ARNOLD KRUCKMAN

News and Views from the Capital

THE most uncertain thing on the legislative horizon is the wage-hours bill. Mr. Roosevelt and other socially progressive persons wish a wage-hours bill enacted into law at the next session of the Congress, which, incidentally, is not now expected to be a special session. On the other hand, the active and vigorous elements that give direction to the A. F. of L. do not want any wage or hours legislation such as is proposed, and these A. F. of L. forces will increasingly exert every pressure to prevent the Congress from making such laws. It is quite probable that by the time this is published these labor leaders may take their places openly beside the Southern members of the Congress and others in the fight against labor legislation.

There is every indication that the labor-legislation conflict may develop into the major issue. The A. F. of L. people have very definitely made up their minds that the National Labor Relations Act must be repealed. They feel that the act and its administration is clearly favorable to the C.I.O., and, of course, unfavorable to the A. F. of L. It has not helped matters that the word has gone out that Chairman Madden of the National Labor Relations Board has informally let it be known that the board will oppose any amendment which will recognize craft unions as empowered separately to bargain with employers on behalf of their members. Such amendments are already pending in the Congress and they will surely be pressed.

The A. F. of L. feels that the issue is its future existence as well as progressive labor legislation, and it feels that the continuance of the National Labor Relations Board, as it functions under the present law, means either the dominance of the C.I.O. or the absorption of all the functions of unions by the government. And apparently the A. F. of L. leaders do not feel that the time is ripe to turn the entire machinery of unionism over to the government. There is also, naturally, the opposition to Mr. Lewis, who is considered a renegade by the A. F. of L. The situation bodes gloom and distress for the Congress in an election year.

Meanwhile business and industry, like other components of the nation, are seriously concerned about taxes and tax laws. It is quite certain that more taxes will be exacted from the nation, and that there will be a complete reconstruction of the whole edifice of tax machinery. The "profound revision" has been persistently and repeatedly reiterated by the President ever since the 5th Congress came into being. Undersecretary Roswell Magill, formerly of Columbia University, an expert in the theory of remaking tax structures, presumably brought into the picture especially for the job, has for many months been working on the plan to be presented to the Congress, and is supposed to be ready to present the fruits of his labors in November.

The Treasury has already begun to reform some of its practices. The widespread criticism resulting from the tax-evasion investigation particularly emphasized conditions in the Internal Revenue Bureau. It was found some taxes had not been collected for several years, although the returns had been promptly filed; and people everywhere complained loudly about the red tape that wasted their time and money in transacting business about various aspects of revenue adjustment. There were particularly vigorous protests from those who were trying to find out where they stood in relation to the so-called "windfall" taxes, the taxes taken by the Congress when the Supreme Court declared the processing tax unconstitutional. Complaints came even from within the Treasury Department itself. Bureaus pointed out that their work was delayed by the cumbersome operation of other bureaus. It was plain that the intricate machine, with its 26,000 employees, was threshing around with more or less futility and needed fixing. Perhaps it was legitimately entitled to repairs. It has been functioning continuously and soundly since 1791, when it began its career by collecting the tax on distilled liquors. Recently it was put to the stress and strain of adding 25 percent. to its size when it was saddled with the collecting of social-security taxes.

The fixer is Harold N. Graves, a career man in the Treasury Department, who was put on the job of overhauling the machine last month. Heretofore he has been coördinator in the law-enforcement section of the Treasury. He needs all the skill and patience and forcefulness and good judgment that can be marshalled to do his job.

In the group who are drafting the permanent revenue structure to be submitted to the Congress is Herman Oliphant, general counsel of the Treasury Department, credited with the corporation-surplus tax law, and the tax-evasion loophole law. However, whatever the "broad tax program" may be, the Congress must adopt it; and the Congress has some ideas of its own. If the Congress had its own way it would not tackle the tax problem at this time. It is clearly political trouble. And all the House and one-third of the Senate must ask the voters to reëlect them next year.

One idea that is brewing in the House Ways and Means Committee is founded on the thought that employers should deduct an income tax from the salaries or wages they pay to those whom they carry on the pay-roll for less than $5,000 per year. If the most ultimate suggestion is made into law the income of practically every person earning as low as $1,200 per year will be taxed. With social-security taxes and other taxes already imposed on pay-rolls it has been estimated this will place the employer in the position of handing something like 20 per cent. of his pay roll total annually to the government. The rate thus reaches the staggering exactions of the European governments, and, in some instances, takes more. There are many persons in the Congress who believe this will stir up the apathetic moderate-income groups who have hitherto been reached only by the indirect taxes, and who have sympathized with the "soak-the-rich" spirit.

The surplus taxes which have been so unpopular with business men also are to be modified, according to the congressional plan. This response to business opinion is not mere kindness and good-will, it is the result of a deluge of extremely vigorous protests that have swamped the Congress as well as the Secretary of the Treasury. The nature of the protests revealed that they were the spontaneous reactions of the business folk who felt the pinch. Over three million employ-

ers turned in social-security reports to the government, and it is surmised that a large proportion of these business men and women let the government know they would fight any more taxation like the surplus taxes.

The plan is to retain the surplus tax, but to provide a qualification under which the business man will be permitted to keep a certain percentage to retire debts and to make capital improvements. It will be wise to bear in mind that this idea is current in the Congress. And the Congress, which may have more spunk when it comes back to Washington, probably will determine the final fate of all tax plans. But it is also wise to bear in mind that the Administration is not in sympathy with any plan to reduce the tax income from the surplus taxes. Mr. Oliphant feels that the surplus taxes were highly effective in driving distributions of accumulated earnings out among the stockholders, and that these dividends accounted for a large increase in taxes from such sources. Also, it is the feeling in the advanced "new-deal" circles that all tax plans should be so formulated as to prevent durable industries from spending funds to expand and to make improvements. The thought in these circles is that tax exactions should be so extracted that if the national income goes up the taxes should also increase, and that the taxes which flow into the Treasury, and are not needed to defray the cost of operating the government, should be used to support non-durable industries, sponsored or operated by the government in order to put the liquid funds into circulation among the submerged third of the population.

Senator Byrd will propose that the various tax-exempt securities, municipal, state and federal, totalling something like $70,000,000,000, should be taxed to bring in a revenue of approximately $500,000,000 annually. He points out that people on the pay-rolls of the federal government, the states, municipalities, towns, counties, villages, school districts and other local political subdivisions, together with their supporting structure, cost the United States each year an aggregate of $20,000,000,000. That is $1 out of every $3 of the national income, or one-half of the contents of the yearly pay-envelope of the average worker. Senator Byrd proposes that something be done to make this overhead bear more of the cost of government.

Senator La Follette wants more surtaxes in order to bring the level of income down sharply, and he wants the tax base to be made much broader. He also wants more "nuisance" taxes, taxes on every small or moderate casual thing or transaction that you may imagine. Secretary Wallace still believes in the processing taxes, particularly to defray the cost of maintaining the farmer's "parity income". There seems considerable reluctance about exacting these troublesome taxes in many quarters in Washington.

It is obvious that the purpose of all these plans is to make the tax exaction heavier, to raise more money by taxation. The President, the Treasury secretary, the chairman of the Federal Reserve Board and others, all tell us more taxes will mean finally a balanced budget and a paring of the public debt which now stands at $36,864,000,000. And, while money is becoming cheaper, they tell us the added taxation and the rebuilt tax structure will save us from the financial troubles that have upset other national business apple-carts. It is good news to the business man that the budget is to be balanced, even at the expense of more taxation. The worker, the wage-earner, doesn't know the difference between a layman's balance, or any other kind of budget-balancing that involves the astronomical figures bandied about in these discussions of national fiscal affairs. He doesn't know how the budget-balancing affects his welfare, nor do probably many others in the professional or executive grades. But they will all feel, oppressively, taxes that touch them directly, and the Congress expects them to say so vociferously, particularly if the prices of food and clothing and shelter continue to go up. Incidentally, a recent government report declares, the cost of living is higher in the District of Columbia than in any other area in the United States. Food costs more and rents are higher. Yet, and this is significant, one of the chiefs of the real-estate oligarchy gloomily stated the other day that there are around 5,000 vacant apartments in the capital.

Another kind of tax problem was recently broached by Attorney General Cummings, when he asked the Supreme Court to end "the immunity from taxation" now enoyed by those "doing business with the federal and state governments". If the government's contention is supported, all private persons or corporations selling or contracting with the federal government will be subject to all non-discriminatory state taxes. Furthermore, it would enable the federal government to tax those doing business with a state. The case in litigation involves the effort made by West Virginia to tax the amounts paid by the United States to the Dravo Contracting Co. for building navigation dams on the Ohio and Kanawha Rivers. The Silas Mason Co. and David H. Ryan, also are parties to the suit by reason of the fact that the State of Washington is attempting to collect a tax from them on the amounts they have received from the United States for their contracting services in building the Grand Coulee Dam on the Columbia River.

Another suit that will make history is that instituted by Attorney General Cummings under the anti-trust laws in the Southern District of New York against the Ethyl Gasoline Corp., charging the misuse of patents to stabilize gasoline prices throughout the United States. The government charges that the corporation controls the sale of more than 70 per cent. of all the gasoline sold in the United States. If the suit is successful, it will upset the entire patent situation in the United States. Exclusive rights based on patents will be wiped out. There will be no more business monopoly built upon patents, it is said.

The Federal Trade Commission has announced that hereafter those against whom it issues its cease-and-desist orders for any reason whatever must be prepared to file reports showing compliance as often and whenever the commission demands. The commission's orders are perpetual, and, therefore, under the new instructions, violators of its orders are placed on perpetual probation. It puts business that has fallen under the commission's ban somewhat in the same situation as a person who has been released from jail and is required to report whenever the officers of the law make the demand.

Members of the cement industry and the Cement Institute filed their answers to the Federal Trade Commission complaint late in September. They deny price-fixing in the custom of filing identical bids, and deny that they are engaged in any unlawful trade practices in the coöperative employment of the multiple-basing-point system. The answer also denies any arbitrary classification of customers. The institute denies that it is engaged in interstate commerce or that it is in competition with producers or distributors.

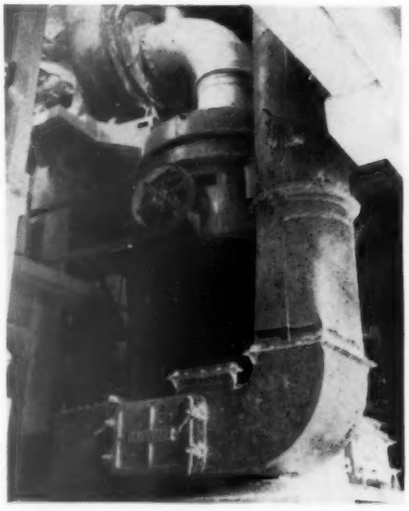
While denying the classification of customers the answer explains that during the N.R.A. days it attempted to set up a code which would have segregated the customers into various categories. The institute also sets forth that it publishes an informative rate book somewhat like the freight-rate books distributed by the railroads. But it disclaims that its books are intended to foster any unfair trade practices.

Part of the Langley, S. C., operations of the Sgoda Corp. Storage shed at the right.

PROCESSING CLAYS FOR INDUSTRIAL USE

The history of J. M. Huber, Inc., leading manufacturer of basic and finished products, including carbon blacks, inks, colors, clays, varnishes, etc., dates back to 1780, when this business was founded. At that time only inks and dry colors were produced. Since then many new products have been added and the steady growth of the company has paralleled the commercial development in this country. In February, 1927, J. M. Huber, Inc., took over a small clay plant at Warrenville, S. C., and operated it as the J. M. Huber Pigment Co., which was later absorbed by the Sgoda Corp., a wholly-owned Huber affiliate. Improvements were made immediately, including the installation of a 5-roller mill and a rotary drier. In August, 1927 this plant burned to the ground. Most of the major equipment was salvaged and used in the construction of a new kaolin plant which was built immediately at Graniteville, S. C. This plant, known as the Suprex plant, was built to dry and pulverize clay for the rubber trades and went into operation on December 23, 1927. Some other improvements were made later.

On January 1, 1929 the company took over the plant of the Paragon Kaolin Co. at Langley, S. C., with a kaolin deposit which had been worked since 1890. It is with this plant that this article is chiefly concerned. As this was then only a small plant an expansion and improvement program was immediately begun. A large drying shed and a rotary drier were installed at that time and a continuous improvement program since has kept this plant up to the best. In 1930 two Sturtevant separators and a Sturtevant hammer-mill were installed.



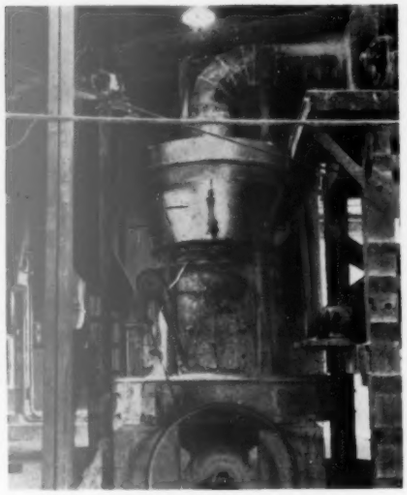
New high-side roller-mill, with integral double separator, just installed.

In 1933 the company started experimenting with washed clay and in 1934 began the commercial production of this material. A Dorr thickener, an Oliver drum-type continuous filter, and a number of screens and Independent filter presses were installed for this purpose. Early in 1937 a Sperry filter press and a number of Tyler Hum-mer screens were added in this department.

Meanwhile the dry section of the plant was also undergoing improvement. In 1936 a Raymond 5-roller mill equipped with a Whizzer separator was installed and a similar mill with a double Whizzer was added early this year. Stokers have been installed on both the rotary driers, and new screw-conveyors and elevators serve the mills and a new 4-tube bag-packer. This plant processes clays for the rubber, ceramic, and other industries.

The two plants have a combined

capacity of 2,000 tons weekly. They are supplied from two pits with two distinct types of clay. The clay in the Chicora pit is used for rubber clay only and is loaded by hand shovels into three Ford trucks which haul it 1 mi.



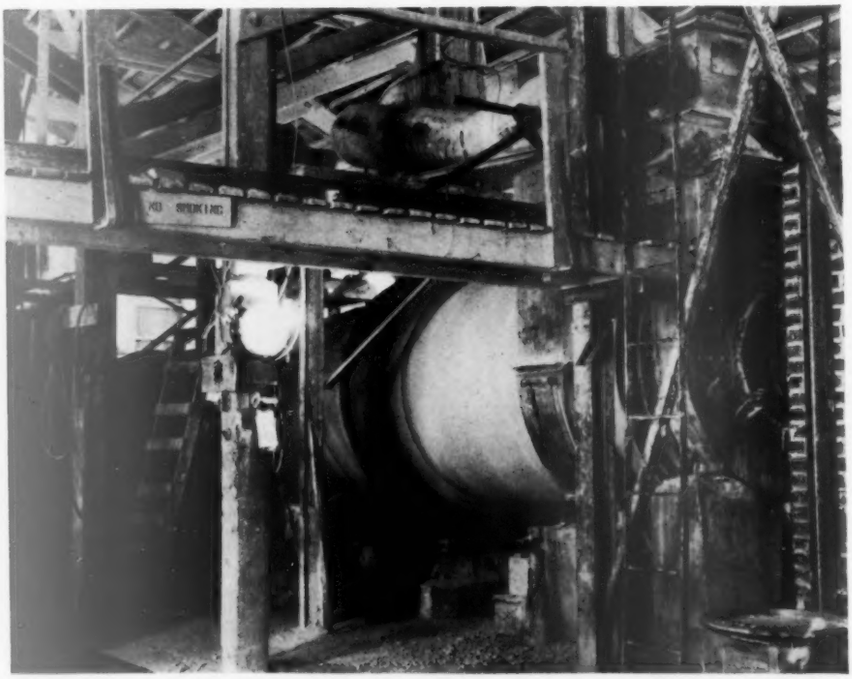
The oldest of the three roller-mills used to grind clay.

The two electrically-vibrated screens which operate in the wet-grinding department for the removal of the coarser particles from the slurry.

to the Paragon plant or 8 mi. to the Suprex plant. These trucks recently replaced a railway-haulage system and have cut haulage costs a third, according to W. J. Driver, manager of operations for the company.

The Paragon pit supplies a whiter clay for the ceramic and paper industries to the Paragon plant only. This material is loaded by a Marion 45 electric shovel with a 1¼-cu. yd. dipper into 5-cu. yd. Koppel dump cars, which are hauled from the pit by two 12-ton Plymouth locomotives. A 6-ton Plymouth gasoline locomotive hauls the cars to the Paragon plant. At both pits the overburden ranges from 5 to 50 ft. in depth and is removed at the Chicora pit by a ⅞-cu. yd. Erie steam shovel. At the Paragon pit the Marion shovel is also used to remove the overburden. All the overburden is hauled away in trucks. The kaolin deposits range from 15 to 35 ft. in thickness.

At the Paragon plant the trucks dump the rubber clay from a trestle on the floor of the 200-ft. drying shed, where exposure to the air reduces the moisture content from 18 to 24 per cent. to about 15 per cent. A separate trestle is provided for the Paragon pit clay which is discharged from the pit



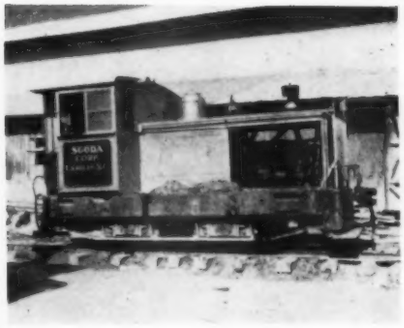
The 45-ft. rotary drier with recording pyrometer at left. A stoker has just been installed on this drier.

Electric shovel loading overburden into truck at the Paragon pit.

cars in a separate section of the storage and drying shed.

The rubber clay is processed in the dry part of the plant. In the drying shed it is shoveled by hand on a 240-ft. belt-conveyor, which discharges it into a Lombard Iron Works slugger-roll crusher. The crusher product is elevated into two 50-ton bins over the two Ruggles-Coles 6-ft.-diameter in-

This thickener is 55 ft. in diameter and settles out clay sludge in the wet side of the plant.



The 25-ton plant locomotive. It is powered by a gasoline engine.

direct-heat rotary driers. Volumetric roll-feeders control the rate of feed into the driers. One of the driers is 35 ft. and the other 45-ft. long and both are equipped with Detroit Stoker Co. Roto-stokers. These stokers have effected a 20-per cent. saving in fuel costs. Raw clay fed to the driers contains about 15 per cent. moisture and this is reduced to from ½ to 2½ per cent. with a consumption of 40 lb. of coal per ton of clay. A series of screw-conveyors and bucket-elevators feed the dried rubber clay into bins over the two Raymond 5-roller mills. All the products are ground to a fineness of over 99.9 per cent. through 200-mesh in these mills. The mill products are carried by a series of screw-conveyors either to the packer bin or direct into cars.

Part of the production is treated by the wet process. The same belt-conveyor in the drying shed discharges this clay into another slugger-roll crusher. A second belt-conveyor feeds the crusher product into a blunger or pug-mill where water is added. The resulting slurry is discharged on a pair of Tyler Hum-mer screens equipped with 200-mesh wire cloth. These screens remove the coarse particles from the slurry, which is then discharged into a 55-ft.-diameter Dorr thickener. Clay for certain special uses can be chemically bleached before going into this thickener. The overflow goes to waste and the sludge settled out is pumped to hydraulic filter presses. Most of these are 36-in. machines made by the Independent Filter Press Co., but the new 42-in. aluminum press was made by R. D. Sperry & Co. Cotton cloth backed up with woven human-hair cloth from China is used in these filters. Cotton cloth, which alone would last less than a week, has a life of several months, when backed up with hair-cloth and the hair-cloth itself lasts several years.

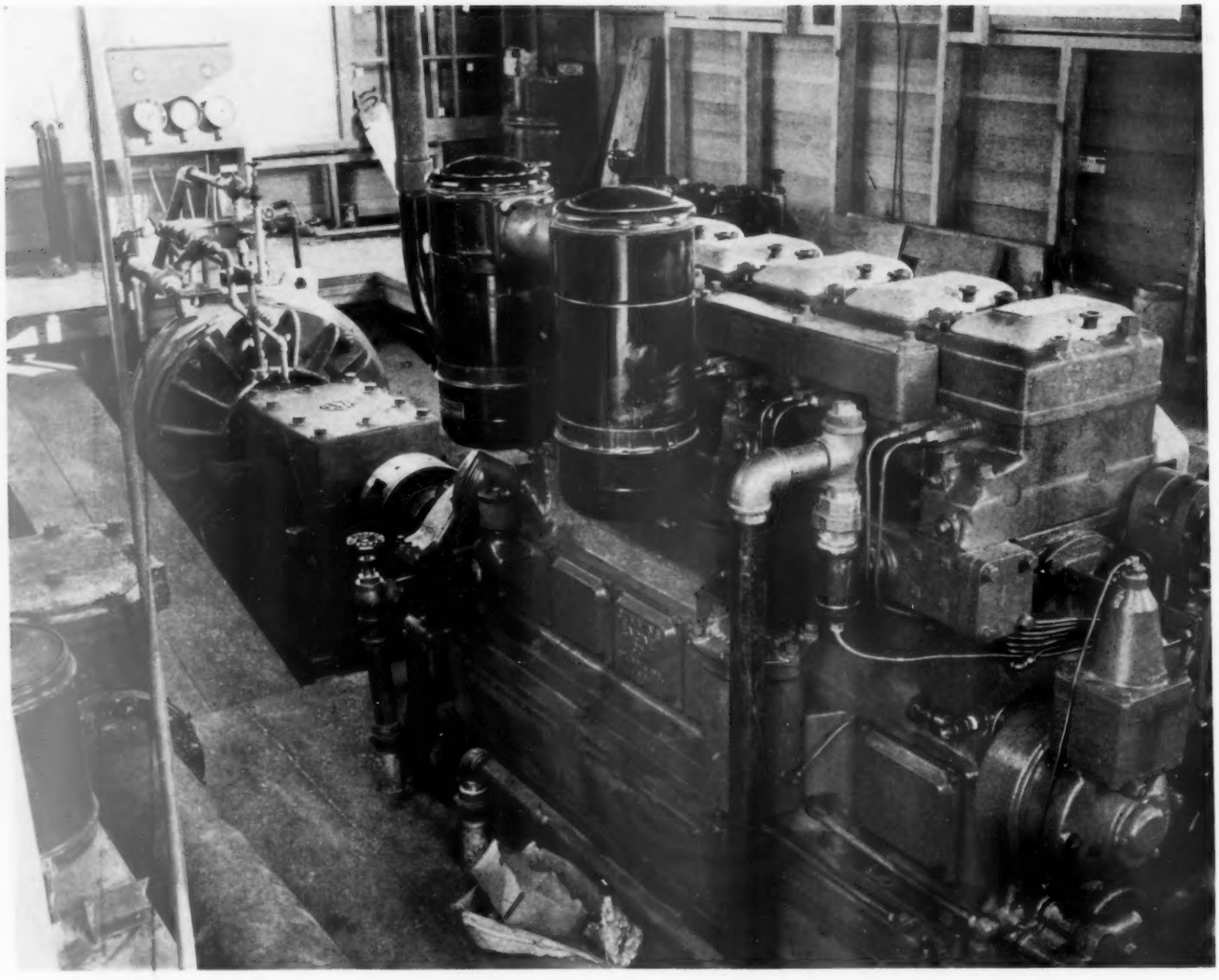
The pallets of filter cake are stripped and loaded by hand on a belt-conveyor feeding a pug-mill. Another belt-conveyor feeds the pug-mill product into the shorter of the two driers. This reduces the moisture content of the cake from 25 per cent. to about 3 per cent. The dried cake can be passed through a hammer-mill and then to a car-loading bucket-elevator, or it can pass the mill and go direct to the elevator.

Arrangements have been completed so that either dry or washed clay can be passed through either or both of the driers. Either or both of the Raymond mills can also be fed from either of the driers. This arrangement was found necessary as each type of user and each customer has his own specifications to be complied with and it is sometimes

(Continued on page 74)

Automatic stoker which has been installed on the 45-ft. rotary drier.

New aluminum filter press which dewaters clay in the wet department before it goes to the driers.



Interior of dredge showing 200-hp. Diesel engine and the 10-in. water-sealed pump with rubber-lined impeller.

BUFFALO SAND CO. LAUNCHES NEW DREDGE

By W. E. TRAUFFER

The Buffalo Sand Co., Lancaster, N. Y., has installed a hydraulic dredge of modern design and construction which incorporates many original features. This change has resulted in an increase in capacity and a new plant is now under construction to process this material, using a deposit that is loose and well-graded and lends itself well to dredging. Surface operations had reached a distance from the plant which made the haulage cost an important factor.

The deposit is within 200 acres of flat farm land with an overburden so light that it can be caved in with the material. The deposit averages about 20 ft. in height above the water-level and has a sand content of about 75 per cent. Its actual depth is 90 ft. to bed rock and the gravel content increases with the depth. Very little large, oversize gravel and no boulders exist to a depth which can be dredged economically.

At present a Marion gasoline-electric shovel with a 1-cu. yd. dipper is being used to excavate material above the water-level. A Northwest gasoline crawler crane with a ¾-cu. yd. clamshell bucket excavates under water. Whenever possible the material from under the water is piled up on the bank to drain before it is loaded into trucks, which haul it to the plant.

The company owns four Mack trucks, one of 7-ton, one of 5-ton, and two of 2½-ton capacity. The sand and gravel are dumped from these trucks into an Erie 50-ton, two-compartment steel hopper. An independently-driven belt-feeder discharges the material on an 18-in. Barber-Greene belt-conveyor which operates on 135-ft. centers and is supported on a structural steel frame of the same make. The material is discharged from this conveyor into a Link-Belt conical screen with 2½-in. perforations.

Oversize gravel is discharged into a Good Roads No. 7 jaw crusher, whose product, together with the material passing through the screen, is discharged on a 155-ft. belt-conveyor

feeding a 4-ft. by 6-ft. Niagara 3-deck vibrating screen equipped with sprays. The three sizes of gravel produced are discharged into bins. The fine material coming through the bottom deck of the screen is passed with the water into a series of four settling cones which produce any desired grades of sand. The truck hopper and crusher in this plant were installed early in 1937.

All the shipments are made in trucks, which are loaded under the four 150-ton plant bins. The shipments are weighed on a Buffalo truck scale. There are also three batching bins which are

Gasoline crawler crane building up a pile for truck-loading.

used to supply batched aggregates for concrete and bituminous road construction. A Marion gasoline-electric crane with a ¾-cu. yd. clam-shell bucket serves the batcher bins and also stock-piles excess materials. This crane and a Barber-Greene loader also load trucks from the stock-piles.

The new dredge about ready for operation with nozzle in position for cables and suction hose.

When the new dredge is in operation sand and gravel will temporarily be pumped into a sump from which a crane will remove them to the truck hopper of the existing plant. In the new plant the material will be discharged from the dredge-line at a height of about 35 ft. above the pump-level on a multiple-deck screen. Coarse gravel will be discharged into piles from which it can be reclaimed and run through the old plant if desired to produce 100 per cent. crushed gravel. Sized gravel will be discharged into bins and sand will be classified in a series of four Allen cones. Two sand-drags will be used. The new plant and dredge are expected to produce about 250 tons of sand and gravel per hr. with only one man on the dredge and one at the plant. The old plant will be kept in reserve and can be supplied by shovel and trucks, as was done in the past. This plant has a capacity of about 100 tons per hr.

Main belt-conveyor from the truck hopper to scalping screen and crusher.

The original plant which will supplement the new plant under construction.

The dredge was designed and built under the direction of Fred J. Decker, president and engineer of Diesel Motors, Inc., Rochester, N. Y. The hull is of welded steel-plate construction and was fabricated by the Dolomite Marine Corp. in its ship-yards at Pittsford, N. Y. It was built in two longitudinal sections, which were transported to the site on a special trailer and were then bolted and welded together. The completed hull has eight water-tight compartments, one of which forms a storage tank for 1,200 gal. of fuel oil for the Diesel engine. The assembled dredge hull is 30 ft. long, 20 ft. wide and 5 ft. deep.

The dredge is powered by a 200-hp. Cummins Model L-6, six-cylinder Diesel engine, which is equipped with oil- and air-cleaners and is started by compressed air. It has a variable-speed control which provides operating speeds up to 800 r.p.m. From its flywheel end this engine drives the dredge pumps through a Twin Disc clutch and a flexible coupling and from its other end drives, through a flexible coupling, a countershaft from which are driven the hoist friction and a Westco gear pump through a V-belt drive with a flat drive pulley. This pump supplies sealing water for the dredge pump and also supplies the hydraulic rams operating the hoist brakes.

Two trucks waiting to unload sand and gravel into plant hopper.

A friction pulley on this shaft operates the suction-line hoist. Air for starting the engine is supplied by a Kellog compressor driven by a Briggs & Stratton gasoline engine.

The Allen-Sherman-Hoff Hydroseal pump has a 10-in. intake and a 10-in. discharge. It has a manganese-steel shell and a Maximix rubber-lined impeller housing. Because the pump and engine are located in a well below the dredge-floor level the pump intake is below the suction-line level and is always full of water. For this reason it is expected that starting will be almost instantaneous, although air-elimination priming is provided.

Jaw crusher with conveyor to plant directly below.

The dredge suction nozzle has a screen of original design cast with two spuds extending beyond the openings. These spuds are intended to loosen the deposit whenever the nozzle is raised because of a cave-in or for any other reason.

The hoist has friction brakes equipped with compression springs which hold the fall line and the nozzle stationary when digging. When it is desired to raise or lower the nozzle, hydraulic cylinders release the brake pressure and the nozzle is then either dropped by gravity or raised by engaging the friction drive.

The method of supporting the dredge-discharge pipe-line also differs from common practice. Each pontoon consists of two oil barrels rigidly fastened together side by side by bars welded across their ends. The pipe, instead of being supported on a framework above the barrels, will rest on and between them.

The general design of the dredge embodies the principle of low center of gravity which considerably affects the operation of a dredge of this type, it being a known fact that the suction head operation tends to rack the dredge.

The Buffalo Sand Co. in its order for this dredge required that the construction should be of a permanent nature, which accounts for the specially constructed fabricated-steel boom 35 ft. long tapered from 8 in. to 24 in. at the base and the mast 20 ft. high of 6-in. steel tubing mounted with fixed-length steel-rod supports and suspension connections.

All the piping and cable movements are on one side of the engine and pump room, so the operator can move about with no fear of cables or other apparatus. The cables at the base of the mast go below deck and out around the engine and pump compartment and turn at the rear to the hoist, entirely out of the work ways of the dredge.

After priming has been accomplished the short-circuit connection between the suction and the discharge of the sealing-pressure pump is opened, after which the pressure is controlled by a spring-loaded valve which maintains the required pressure over the head pressure to insure better protection without constant attention by the operator.

The entire control of this dredge is accomplished by one lever and three gages, the lever controlling the hydraulic operation of the hoist friction and brake, and the gages indicating the sealing pressure, head pressure and vacuum.

The engine is controlled by a remote-control foot throttle or accelerator located in the floor at the operator's station. Accessibility of every unit was the first consideration and plenty of room has been provided around the pump, engine and hoist, even though this dredge is 10 ft. shorter than most dredges using the same size of pump.

Sgoda *(from page 71)*

necessary to concentrate the entire capacity of the plant on one type of material to fill a large order.

Both sacked and bulk products are loaded into cars for shipment. A 25-ton Plymouth gasoline locomotive hauls these cars to the main line of the Southern Rwy. for shipment. This locomotive also switches cars at the plant. Paper clay is shipped all over the United States and Canada and rubber clay is shipped to European countries, Japan, South America and even as far as South Africa.

The main plant office for both plants is located at Langley. A complete physical and chemical testing and research laboratory is maintained there under the direction of Dr. Isaac Drogin, chief chemist of the company, whose headquarters are at the offices of J. M. Huber, Inc., in New York. There is also a control laboratory at each plant where tests are made at least every half-hour to check the product against master samples. These tests are later checked by others made in the main laboratory.

Bulldozer Pushes Waste into Worked-Out Pit

Bridgetown Sand & Gravel Co., Berlin, N. J., makes good use of worked-out sand pits to dispose of overburden. A Le Tourneau U-12 Carryall scraper, pulled by a Caterpillar RD8 tractor is used for stripping overburden, which is piled alongside the pits; then, as soon as the sand is removed, a Bulldozer is employed to push the waste into the worked-out pit. When not busy at this, the Bulldozer is used for clearing ahead of the scraper.

The overburden consists mainly of coarse sand and gravel. The average loading time is 1 min. The average round trip time on a 1250-ft. one-way haul, including 200 ft. of 6 per cent. adverse grade, is 8 min.

The sand produced by the Bridgetown company is used in the manufacture of steel molds and glass.

By JOHN W. O'LEARY
President, Machinery and Allied Products Institute

TECHNOLOGY AND THE AMERICAN WORKER

THE success of a technological civilization depends upon the benefits of machinery being enjoyed by consumers as well as producers, by employees as well as employers. Furthermore, it depends upon a general appreciation of the relation of technology to the average American family. Widespread knowledge of the contribution of technology to the American standard of living will lead to greater coöperation in obtaining the maximum benefits of technological progress for all.

It was with this thought in mind that the Machinery and Allied Products Institute undertook to determine what, if any, benefits the consumer enjoys from industrial mechanization. The findings were published in a pamphlet, *Technology and the American Consumer,* which followed three previous pamphlets on employment. The study dealt principally with purchasing power, although it became evident that the American consumer enjoys many benefits of technology besides those connected with prices and wages.

More than two-thirds of the purchasing power of the people of the United States comes from wages and salaries. Out of every $100 of national income about $67 are wage and salary payments. The total national income of the United States is higher than that of any other nation and American labor is better paid than any other. Not only does the American receive more money but he is able to buy more with what he earns.

Facts published by the International Labor Office of the League of Nations, Geneva, Switzerland, reveal the following comparison of real wages in July, 1930:

United States	100.00	Poland	32.10
Canada	81.57	Austria	25.26
Great Britain	52.63	Jugoslavia	23.68
Holland	43.15	Spain	21.05
Germany	38.42	Italy	20.52

The wage of the American worker would buy almost twice as much as that of the British and almost five times as much as that of the Italian (Fig. 1).

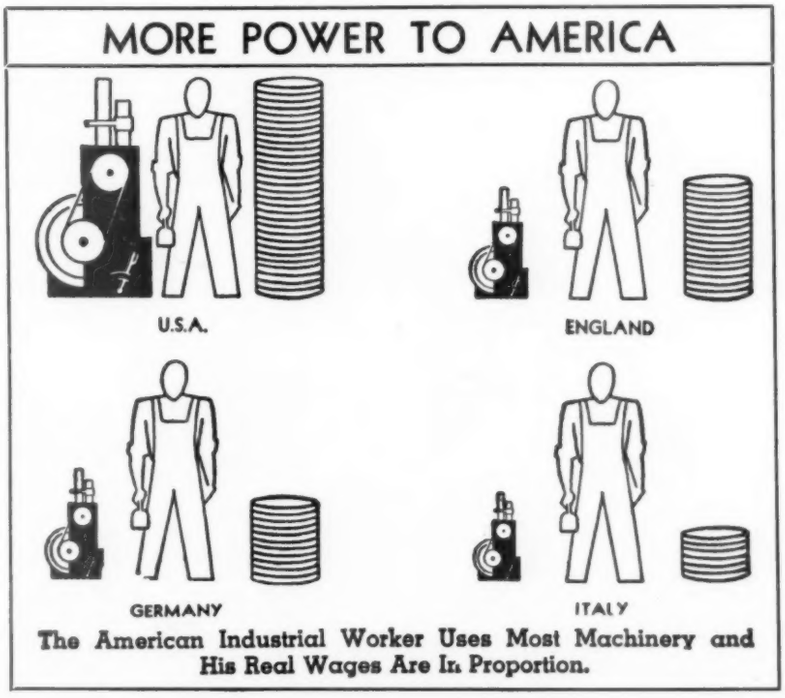
An independent study of purchasing power of wages in terms of 23 food items based on statistics from the International Labor Office shows that the American worker has a 100-per cent. advantage over the worker in Great Britain, about a 200-per cent. advantage over the worker in Germany, and about a 300-per cent. advantage over the worker in Italy. The study was based on the average consumption of such items as bread, butter, beef, pork, potatoes, sugar, milk and eggs of 100 American families of 2 adults and 3 children each.

What determines a worker's wage? There are many factors, but one of the most important is the worker's capacity to produce, the amount of work he can do. American workers are the most productive in the world. This is especially true of factory workers. They are undoubtedly better trained and more capable than those of other countries, and great natural resources make it easy to produce abundantly, but a factor of greater importance is the equipment with which Americans work. Figures given in the census reports of various countries show that in the United States 4.86 hp. of equipment is used per industrial worker, 2.61 in Germany, 2.56 in Great Britain, 2.17 in Canada, 2.14 in Italy, and 1.78 in France. In every country upon which figures of industrial mechanization are available there is a close relationship with real wages.

It is the increase in production resulting from mechanization which made it possible for the average factory worker to earn about 62 c. per hr. in 1936 as compared to about 25 c. in 1914. Working hours declined from 51.5 per week in 1914 to about 39 in 1936, so that weekly earnings were $12.68 in the first case and about $25 in the second, according to National Industrial Conference Board reports.

There was abundant proof that mechanization had greatly increased wages in America, not only directly in industry, but indirectly throughout almost all occupations. The next question then is its effect on prices.

Technology affects prices chiefly by way of increased volume of production. A generation ago, when only about 100,000 automobiles were made each year and modern mass production methods had not been developed, the average price per vehicle was about $2,000. To-day production is about 3,500,000 cars a year and the average price has dropped about two-thirds. Less than a dozen years ago, when only about



The American Industrial Worker Uses Most Machinery and His Real Wages Are In Proportion.

Fig. 1

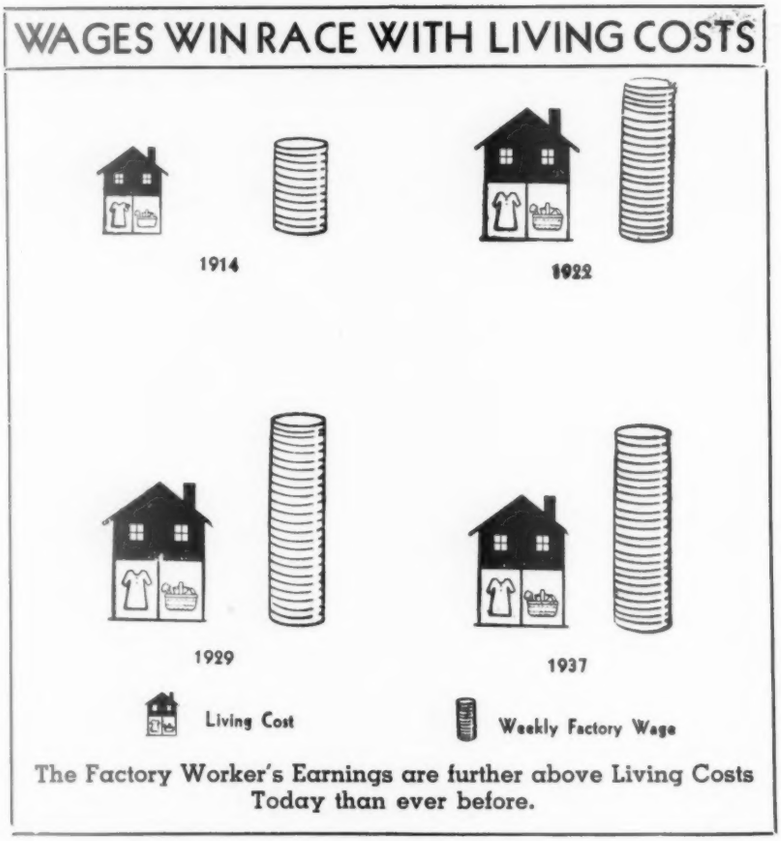


Fig. 2

200,000 domestic refrigerators were produced a year, the average price was $400 as compared to $163, when annual sales had reached the 2,000,000 mark. The first electric clocks placed on the market sold for $30; by the time 2,500,000 a year were being sold the average price had dropped to about $4. A tenfold increase in production of rayon yarn within a few years brought a price decline of 90 per cent. In hundreds of cases such as these technology may be credited with both increased production and increased consumption.

From a practical standpoint the first evidence of technology's benefit to the consumer should be an improved relationship between wages and prices, between income and products bought. The cost of food, clothing, shelter and other items in the budget which go to make up the cost of living, as compiled by the National Industrial Conference Board, were about 40 per cent. higher in 1936 than in 1914. The average weekly earnings of all factory wage earners were 93 per cent. higher. The factory worker's earnings were further above living costs in February, 1937, than ever before in the history of detailed industrial statistics (Fig. 2).

Prices are usually spoken of in terms of dollars, but marked fluctuations sometimes change the value of a dollar 10 or 25 per cent. within a few months. The buying power of wages offers a more accurate indication of the family's ability to maintain or raise its standard of living.

A study of prices of a number of widely used machine-made products in 1914 and 1936 and their relation to factory-wage levels in the same years shows a 63-per cent. improvement in consumer purchasing power (Fig. 4). In the accompanying table are shown the items studied, listed under twenty headings, with prices in 1914 and 1936 and the number of hours required by the average factory worker to earn each product in 1914 at the average wage of 24.7 c. per hr. and in 1936 at the average wage of 62.4 c. per hr. (Fig. 3).

Clothing for a family of four which in 1914 cost the earnings of 709 hours can be purchased to-day with the earnings from 349 hr. The price increased from $175 to $218 but this was far more than offset by the gain in earnings.

The average man's felt hat, which cost $2.85 in 1914 can be bought to-day for $2.15, and although it required the earnings of 11½ hr. in 1914 it can be purchased with the earnings from 3½ hr. to-day.

The time to earn the average pair of work shoes has dropped from 9 hr. and 15 min. in 1914 to 3 hr. and 24 min. to-day, and the price has dropped from $2.30 per pair to $2.10.

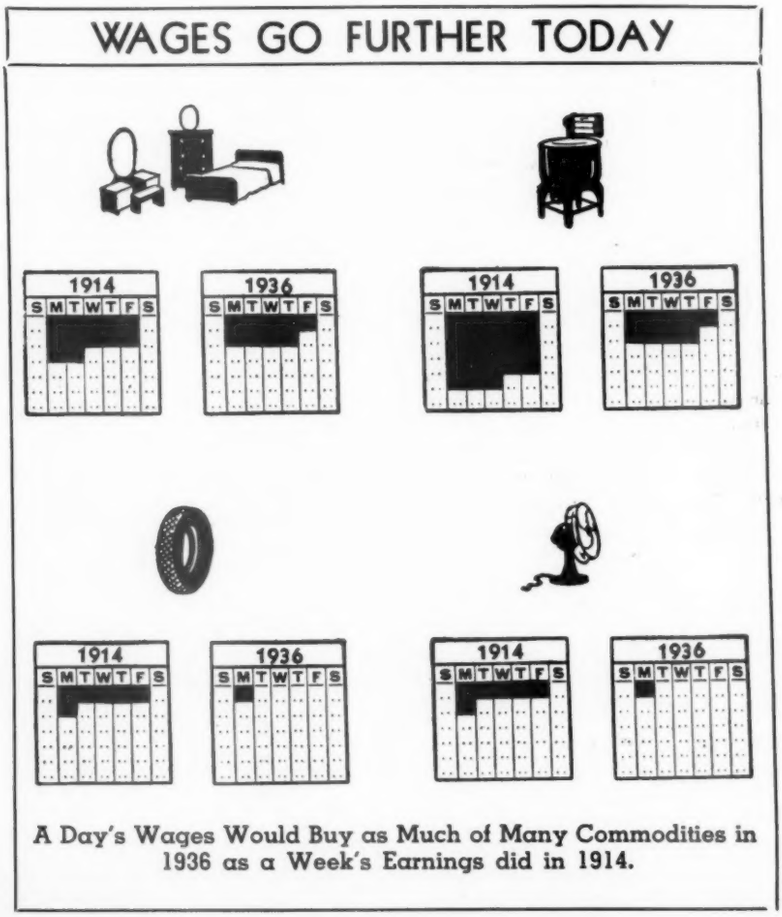


Fig. 3

To purchase 100 representative articles of house furnishings it required the earnings of about 405 hr. and to-day only 279.

Three-piece bedroom suites, which in 1914 consisted of bed, dresser and washstand, cost the earnings of 104.3 hr., and 3-piece suites consisting of bed, vanity or dresser, and chest of drawers, all of superior quality, can be purchased to-day with the earnings of 77.8 hr.

A 9-ft. by 12-ft. Axminster rug can be purchased to-day with the earnings of 49 hr. of work at the average factory wage, whereas the rug of the same size and inferior quality in 1914 cost all a factory worker could earn in 85 hr.

The price of baby carriages, in hours necessary to earn them, has dropped from 41 in 1914 to 14 hr. and 20 min.

The cost of a set of dinner dishes in 1914 was as much as a factory worker could earn in 40 hr., and to-day the cost represents the earnings of 17 hr.

Electric washing machines, which were crude novelties in 1914, cost the earnings of 187 hr. of labor as compared to modern ones which can be purchased to-day with the earnings from 71 hr.

Electric sewing machines were not available to the average consumer in 1914, but one can be purchased to-day with the earnings of 68 hr., about the same as a foot-pedal model in 1914.

Electric-light bulbs in 1914 were so short-lived that they were sold in standard packages of 50 lamps each, and a 60-watt bulb which cost 43 c. then was inferior to one selling for 12 or 15 c. to-day, and the time required to earn the respective bulbs dropped from 1¾ hr. to less than 12 min.

An electric fan cost $12.20 in 1914, and in order to buy it the average factory worker spent the earnings of almost a week's work. A superior product to-day can be purchased from the earnings of less than a day's work.

An automobile in 1914 cost the earnings of considerably more than a year's work, whereas a greatly superior automobile to-day can be purchased with the earnings from less than 1,000 hr.

An average automobile tire for a small car in 1914 cost the earnings of 46 hr. as compared to 9.5 hr. for a tire for the average late-model car to-day.

The time required to earn the average tube has declined from 10 hr. and 18 min. in 1914 to 1 hr. and 42 min.

The time required to earn a coaster-brake bicycle in 1914 was 75.5 hr. as compared to 41.3 hr. to buy a greatly superior model to-day.

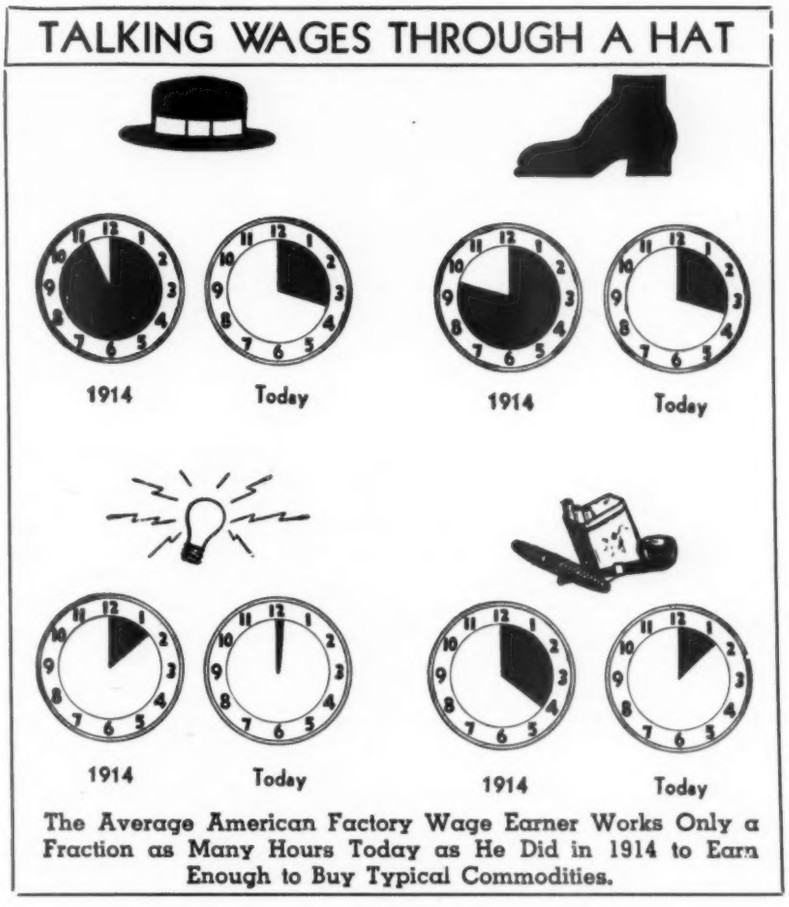


Fig. 4

To earn enough to paint the average two-story house which required 10 gal. of paint, the average factory worker would have had to work 59 hr. in 1914 as compared to 25 to-day.

A camera at $13.80 to-day is capable of giving a performance greatly superior to that of an average 1914 product priced at $36.25. The time required to earn it is only about 22 hr. as compared to 147.

Although a representative collection of drug and toilet articles which cost $1 in 1914 cost $1.39 in 1936, the time required to earn them dropped from 4 hr. in 1914 to 2 hr. and 12 min. in 1936.

The factory worker to-day can buy as much tobacco with the earnings of 1 hr. and 48 min. as he could with the earnings of more than 4 hr. in 1914.

Despite a 21-per cent. increase in the general price level, ten items showed declines in price, varying from 4.65 per cent. in the case of electric washing machines to 72.09 per cent. in the case of electric-light bulbs. All the prices used, except in the case of automobiles, are at retail, so they reflect changes in marketing costs which are not revealed in wholesale prices. The sources of price information were chiefly the National Industrial Conference Board cost of living reports, Sears Roebuck & Co. catalogs, and the reports of the Auto-

PRICES OF WIDELY-USED MACHINE-MADE PRODUCTS AND THE PURCHASING POWER OF FACTORY WAGES IN 1914 AND TO-DAY

	Price		Hours for Factory Worker to Earn the Product	
	1914	To-day	1914	To-day
Clothing (year's supply for family of 4)	$175.00	$218.00	708.5	349.4
Hats, men's felt	2.85	2.15	11.5	3.5
Shoes, men's work	2.30	2.10	9.3	3.4
House furnishings (30 articles)	100.00	174.00	404.8	278.8
Bedroom suites, 3-piece	25.75	48.55	104.3	77.8
Axminster rug, 9 by 12 ft	20.95	30.30	84.8	48.5
Baby carriage	10.15	8.95	41.0	14.3
Dishes (dinner set)	9.90	10.55	40.0	16.9
Washing machine (electric)	46.25	44.10	187.2	70.6
Sewing machine	16.90	32.10	68.4	51.4
Light bulb (60-watt)	.43	.12	1.7	.2
Automobile (average wholesale, 1914 and 1936)	761.20	536.00	3,081.7	859.0
Tires, casing (for small car)	11.35	5.95	45.9	9.5
Tube (for small car)	2.55	1.10	10.3	1.7
Bicycle (coaster-brake)	18.65	25.80	75.5	41.3
Paint (average house)	14.65	15.50	59.3	24.8
Camera	36.25	13.80	146.7	22.1
Drug and toilet articles	1.00	1.39	4.0	2.2
Tobacco	00·1	1.12	4.0	1.8

mobile Manufacturers' Assn. The prices are for typical qualities, models and styles in 1914 and to-day. In many cases there have been great improvements in value not reflected in prices.

The conclusions reached as a result of the study were:

1. Technological development has made it possible for the United States to come closer to solving the problem of producing plenty than any other country in the world. Only by the development of mass-production methods, dependent upon technology, has it been possible to develop either the wide variety of goods available to American consumers or the immense quantities which are necessary to supply American needs.

2. Technology is largely responsible for the high American wage level because it has made possible greater production per worker in most major industries than is found anywhere else in the world. Since wages and salaries represent more than two-thirds of the nation's consumer purchasing power they play an important part in determining the American standard of living.

3. Technology makes it possible to produce countless necessities and luxuries at lower prices than would be possible with less efficient methods.

4. Improvement in the value per dollar expended for machine-made products is constantly taking place as a result of scientific and technological development.

5. The purchasing power of the consumer's income offers a truer indication of participation in the benefits of technological development than do either prices or wages by themselves.

6. In 1936 the cost of living, according to the National Industrial Conference Board index, was 40 per cent. higher than in 1914, but hourly wages of the average factory worker were two and one-half times as high, and weekly wages were about twice as high in 1936 as in 1914.

7. The general price level, as indicated by the United States Department of Commerce wholesale commodity price index, was 21 per cent. higher in 1936 than in 1914, but ten out of twenty products in the manufacture of which there has been great technological improvement showed a decline in price.

8. The consumer with the average factory worker's wage could buy these 20 widely-used items with the earnings of 63 per cent. fewer hours of work in 1936 than in 1914.

Kemite—A New Ceramic Material

EXPERIENCE has shown that the materials commonly used for certain purposes do not inherently fulfill in the highest degree the exacting requirements of such service. Wood, for instance, is not fireproof and repeated applications of protective finishes are required in order that it may withstand chemical action. Asbestos, in any of its forms, is fireproof but it must have special fabrication to provide adequate strength and acid-resistance. Soapstone, one of the most generally used materials for laboratory-table tops, for example, does not long retain its smoothness and pleasing appearance because it is relatively soft and will crack or spall when subjected to localized heating. Vitrified tile is used for many purposes but, because it is produced in small sections, articles made from it have many dirt-collecting joints; it is difficult with tile to attain even a relatively smooth surface.

These considerations led to the thought that it might be possible to work out by research a material that would have none of these disadvantages. Experimental work extending over a period of years resulted in the production of a porous, non-warping ceramic body that is impregnated with bituminous substances and then heated under special conditions to form coke in the pores. Unusually high resistance to thermal shock is imparted to the material because artificial cordierite, a mineral that has a very low thermal expansion, is used in making up the ceramic body.

Thus there was produced a material that can be polished to velvety smoothness, posssessing sufficient hardness to resist scratching and abrasion, ample structural and impact strength, denseness that prevents absorption of liquids, resistance to solvent action and chemical attack, and the ability to withstand perfectly the effect of rapid heating and cooling.

Manufacture—The methods of manufacture of Kemite, which is the name of this new material, are interesting and, with respect to the molding, unusual. The batch of ceramic body, in the form of a slurry, is poured into molding pans of special construction. These pans are placed in a pressure tank so designed that, when air under pressure is admitted, the water is forced out of the slurry in a manner similar to the operation of filter pressing and the clay mixture in each pan takes the form of a compact slab, when it is to be used for laboratory-table tops. Each slab is removed from its pan and dried, and then fired in a vertical position in a tunnel-kiln. In the latter process the slab becomes hard and rigid and can be handled independently in subsequent operations.

The slab is ground to a specified thickness and cut to the required length and width. It is then immersed in a bath of liquid bitumen and completely impregnated under presssure. After heat treatment in a tightly-closed oven to expel the volatile constituents of the impregnant and, at the same time, to form a residue of coke in the pores of the body, the slab is given a final polish and is then ready for installation.

Properties—The properties of Kemite are as follows:

Weight per cubic foot lb.	117
Specific gravity	1.87
Water absorption *percentage*	0.75-1.0
Transverse strength *lb. per sq. in.*	3,000
Crushing strength *lb. per sq. in.*	11,300
Coëfficient of expansion (R. T.-450 C.)	0.0000025

Uses—While Kemite was developed primarily as a laboratory table-top material, it is evident, because of its inherent properties, and the fact that it can be fabricated in complicated shapes of large size without joints, that uses can be found for it in other, wider fields. When high resistance to thermal shock is not required, cordierite is not used in the ceramic body and ware made from the non-cordieritic body is called "Karcite." Either body can be impregnated with sulphur or resinous materials to produce ware for special uses.

Kemite has proved to be a satisfactory material for table tops, hoods, and other forms of laboratory equipment, and for such applications a specific designation, Labstone, is used. Karcite is being used in the laboratory field for shelves, sinks, tanks, pipe, and pipe fittings. Either material can be employed for flooring to meet special requirements in the laboratory and in chemical industry. In the latter field, Kemite should prove useful for vats, tanks, and other apparatus, because of its resistance to the action of chemicals and its low thermal expansion.

In the electrical industry the basic body, properly impregnated, can be employed for switchboard panels, specially-molded parts and complex shapes, and as an insulating material.

In general building construction, Kemite should be of utility, particularly in ornamental forms which, when made from other materials, often deteriorate by the action of moisture and changes of temperature. Karcite can be used in many forms, such as sanitary ware, partitions, roofing, flooring, stair treads, wainscoting, and window sills.

P AND Q
PROFITABLE
New Products
SECTION

Aggregate - bituminizing plant of the General Crushed Stone Co., Rock Hill, Pa. Electrically-heated storage tank at right.

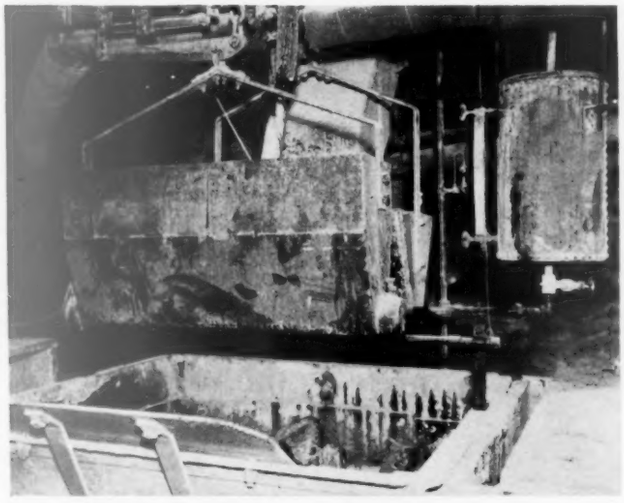
Electricity Supplants Steam at Aggregate Bituminus Plant

The General Crushed Stone Co., one of the country's largest producers of crushed stone, has in recent years also become one of its leading producers of bituminized aggregates. This company now operates 12 crushed-stone plants, 2 sand-and-gravel plants, and 12 aggregate-bituminizing plants in Pennsylvania, New York and Massachusetts. Several of the bituminizing plants have been built in the last few years and one has just been completed at Smithport, Pa.

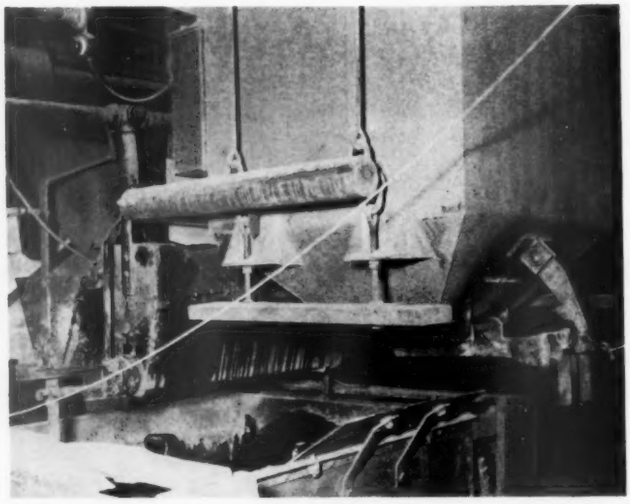
While the newest plants incorporate some of the most modern equipment available to this industry one of the company's oldest plants was selected to try the use of electricity instead of steam for heating the bitumen. A. G. Seitz, vice-president in charge of operations of the company, conceived the idea of heating asphalt electrically and installed an Easton-Clarmac heater in the company's plant at Rock Hill, Pa., in 1936. This heater is made in this country by the Easton Car & Construction Co., Easton, Pa., under license from the British inventors and patentees. It was so successful that electric heating elements were installed in one of the bitumen-storage tanks at this plant. Three electrically-heated bitumen-weighing buckets, made by the Easton Car & Construction Co., were also installed in this plant several months ago. Another Clarmac heater is used in the company's plant at Auburn, N. Y.

The Rock Hill quarry was opened in 1903 and the aggregate-bituminizing plant was built about ten years later. Few changes were made in this plant until the electric heating equipment was installed. The capacity of this plant is 60 tons per hr.

The plant is a typical Amesite plant. Crushed trap rock containing sufficient fines is brought from the crushed-stone plant in trucks and is discharged into a hopper. A bucket-elevator feeds the stone to the direct-heat, oil-fired rotary drier. This drier will soon be replaced with a new type of rotary drier developed by the company. Another bucket-elevator lifts the dried



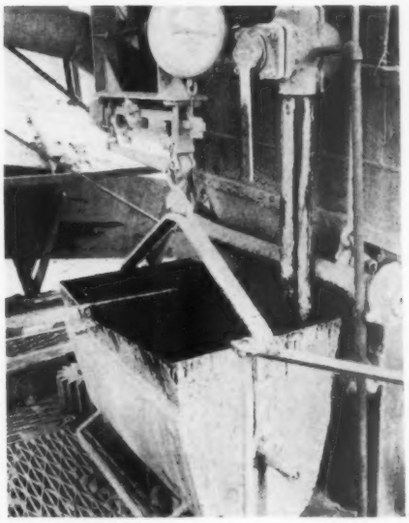
One of the electrically-heated bitumen weighing buckets over a mixer.



Another view of the bucket with filler and stone-batchers at the left and right.

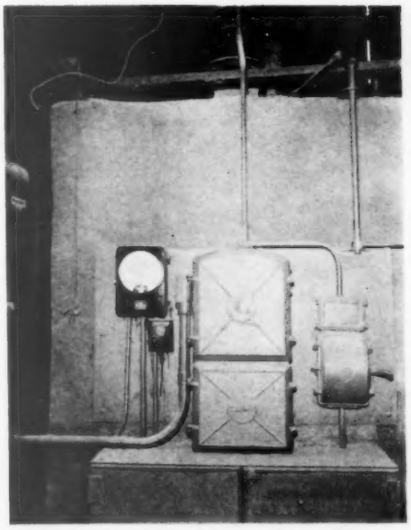
stone to a 4-ft. by 6-ft. vibrating screen. The stone, varying from 1¾ -in. down as desired, is discharged into a 3-compartment storage bin. The dust falls into a single bin running the full length of the stone bins.

Asphalt of from 85 to 100 penetration is received in tank-cars, which can be heated with steam if necessary in cold weather. The asphalt is usually pumped into the 10,000-gal. electrically-heated steel storage tank. Three 9,000-gal. steam-heated concrete tanks are used to store a reserve supply.



Old steam-heated bitumen weighing bucket which is still used on one of the three mixers.

The 10,000-gal. tank is cylindrical and is 30 ft. long. Six electric-heating elements, each 10 ft. long, extend from one end into the tank horizontally about a foot above the bottom. These elements heat the asphalt sufficiently so that it will flow freely through a valve located just above the elements and 4 ft. from that end of the tank. As this asphalt runs out the asphalt in the far end of the tank slowly slumps toward the heater end; in this manner a steady supply of hot asphalt is assured. A man-hole at one end of the tank gives access to the inside. The heating elements can be removed from their protective pipes at any time from the outside of the tank. A Bristol recording thermometer automatically keeps the temperature between 225 and 260 deg. F.

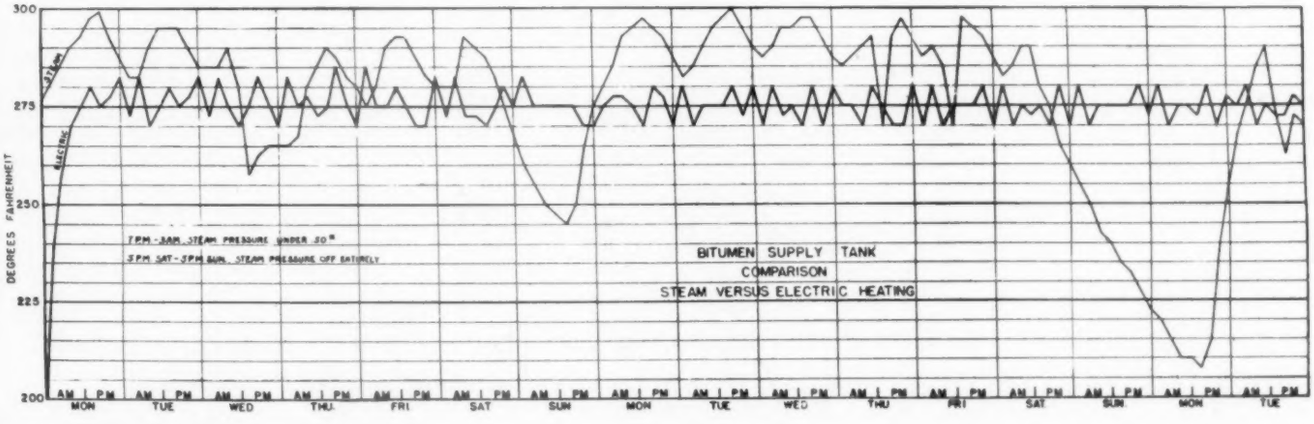


Control panel on the automatic electric bitumen heater. Motor of bitumen pump above.

The asphalt flows by gravity from this tank into the Easton-Clarmac heater. The heater installed in this plant consists essentially of a rectangular insulated steel tank 6 ft. wide, 7 ft. high and 10 ft. long. Its capacity is 3,000 gal. The heating elements are located near the bottom of the tank and are arranged in two horizontal rows, the intake of the bitumen pump being located between these elements. This gear pump operates inside the fluid and is heated by it, an obvious advantage over the usual external type of pump. It is driven through a vertical shaft by a reversible electric motor mounted above the heater. The hot bitumen is pumped through an insulated pipe serving the three asphalt mixers. Any excess bitumen flows back into the heater. When the plant is shut down the pump is operated in reverse long enough to clear out the feed line by suction. The pump motor has its own controls.

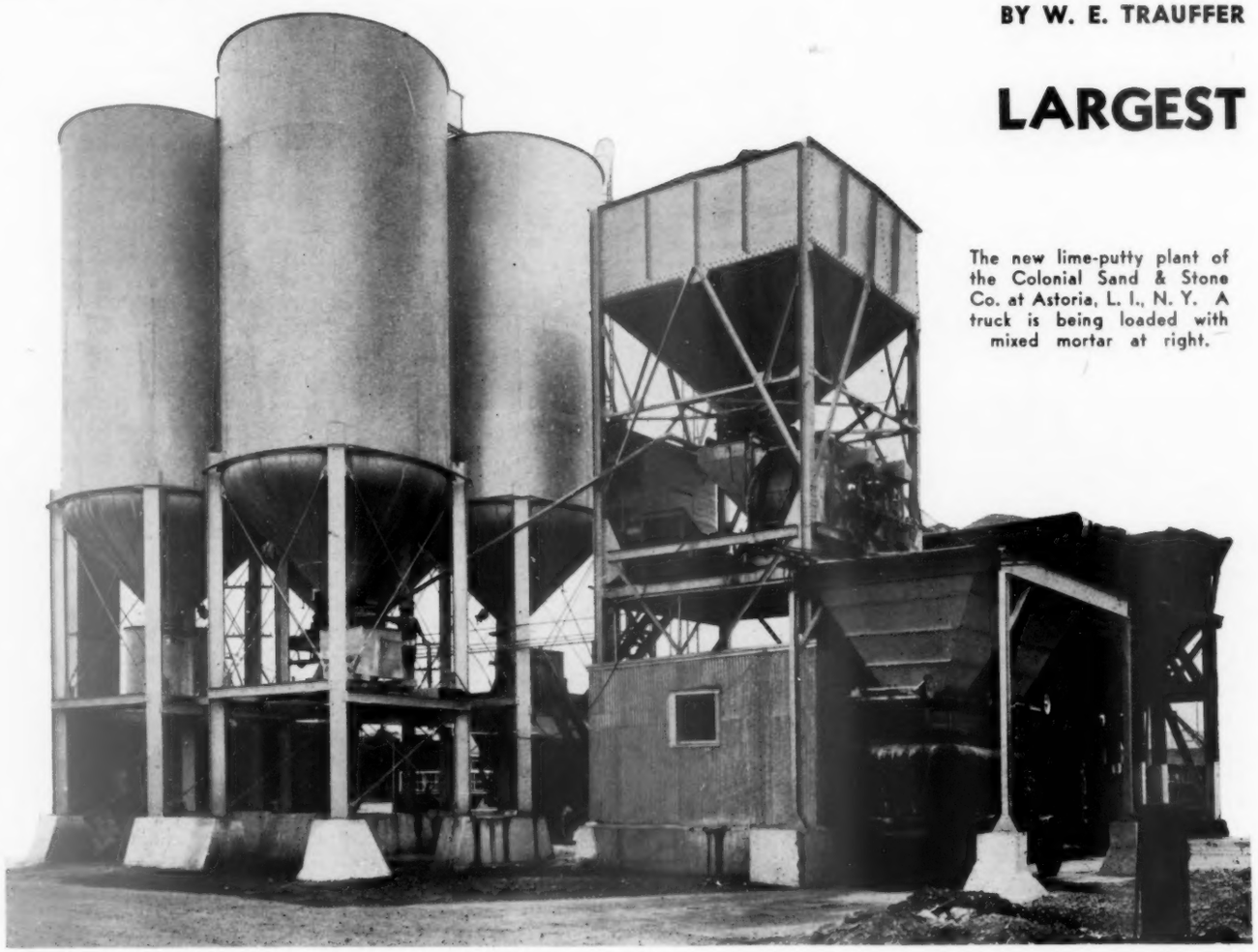
A Bristol combination recording thermometer and thermostat registers and controls the heat of the bitumen within the limits of 275 and 285 deg. F. A mercoid switch actuates a magnetic switch which turns the current on and off as required. Each element also has an individual switch so that any number of elements can be used as desired. When rapid heating is necessary, all the elements can be turned on. For steady operations it is found economical to use only enough elements to maintain the temperature at the desired level as this keeps the electrical demand charge down to the lowest possible limit. One of the main advantages of the Clarmac heater is the fact that its contents are automatically kept hot over night or over week-ends at a very low cost because of the cheap off-peak power used. No tedious and expensive heating-up process is necessary and operations can begin without delay at any time. The absolute temperature control also prevents deterioration of the bitumen by overheating.

The Easton bitumen weighing bucket is stationary and discharges its contents through a rotary valve in the bottom. The manual labor necessary in tipping and dumping a steam-heated bucket is eliminated. A better distribution of the bitumen in the mixer is said to be obtained with this bucket and the absence of steam pipes has made it possible to move the naphtha line to the center of the mixer. The electric heating element is inside the rocker valve. Each of the three 1-cu. yd. mixers is fed by this type of bucket.



BY W. E. TRAUFFER

LARGEST

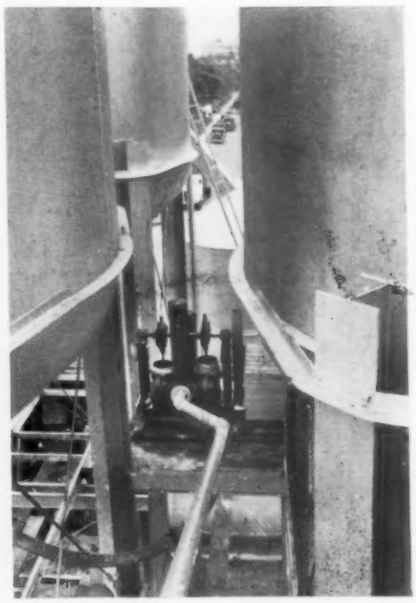


The new lime-putty plant of the Colonial Sand & Stone Co. at Astoria, L. I., N. Y. A truck is being loaded with mixed mortar at right.

THE Colonial Sand & Stone Co. has for many years been one of the largest distributors of sand and gravel in the New York metropolitan area. Under the guidance of its president, Generoso Pope, this company has also become an important producer of ready-mixed concrete. In 1931 the sand-and-gravel plants of the Goodwin-Gallagher Sand & Gravel Co. were acquired, making the company one of the leading producers of sand and gravel in this country. This business is now operated as the Metropolitan Sand & Gravel Corp. In 1933 the company took over ready-mixed-concrete plants located at some of its yards. In 1935 the company entered the ready-mixed-mortar field when it purchased the plants, equipment, license rights, etc., of the Blue Diamond Service Corp., which pioneered this product in the New York area.

Durando Miller, former president of the Blue Diamond Service Corp., was made a vice-president of the Colonial Sand & Stone Co. in charge of the newly-formed Mortar Division. In 1935 the old Blue Diamond plant at 54th St. and East River was dismantled and a small vat-type plant was built at Bayside, L. I., to test the demand for lime putty and mortar in Queens.

The results were so satisfactory that the company secured license rights to the Brooks-Taylor lime-putty process for the metropolitan district. Its new plant at Astoria, L. I., the largest Brooks-Taylor plant yet built, was put in operation July 1, 1937. It has a capacity of 600 cu. yd. in an 8-hr. day and is unusual in that it incorporates a mixing plant for the production of premixed lime mortar. This makes it possible to produce a ready-mixed lime-putty mortar either in the central-mixing plant or in truck-mixers as desired.



The duplex reciprocating pump which transfers lime putty from aging tanks to mortar mixers.

The quicklime used in this plant is shipped in 5-ton watertight containers, of which 12 are carried in a regular gondola-type freight car. At the siding a crane lifts a container out of the car and places it in position over a truck into which its contents are discharged. The trucks used hold 10 tons of lime, or the contents of two containers. At the plant the lime is discharged into the boot of a 50-ft. inclosed bucket-elevator which drops it into a 20-ton dry-lime storage bin.

The quicklime is discharged from this tank into a mechanical slaker equipped with a Taylor recording thermometer, which enables the operator to keep the slaking temperature within the desired limits and eliminates any possibility of burning or drowning the

LIME-PUTTY PLANT GOES INTO OPERATION

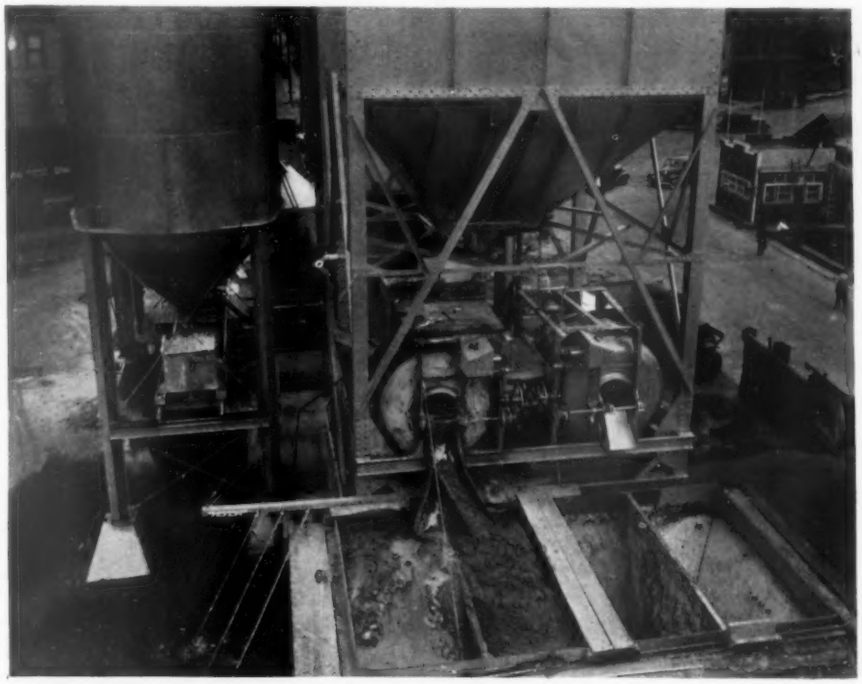
lime during the slaking process. The slaked lime putty is then pumped into one of the four 5,000-cu. ft. aging tanks by a Carter Humdinger Simplex pump. This single-acting plunger pump makes it possible to handle a lime putty of the maximum density desirable. The addition of excess water to give the putty greater fluidity is not necessary.

The aging tanks are 15 ft. in diameter and 35 ft. deep but otherwise are similar to previous installations of Brooks-Taylor plants. Each tank has four octagonal vertical filters filled with sand, which drain out the excess water during the aging process. The tanks are twice the size of those generally used and the filtering problem is a little more difficult than that generally encountered. Mr. Miller finds an advantage, therefore, in distributing four filters in each tank, thus breaking the field into four sections instead of trying to bring all the putty into one central filter.

The lime putty is discharged from these tanks into two batching cars running on rails under them. Each car serves one row of two tanks. These cars discharge the lime putty into trucks for delivery.

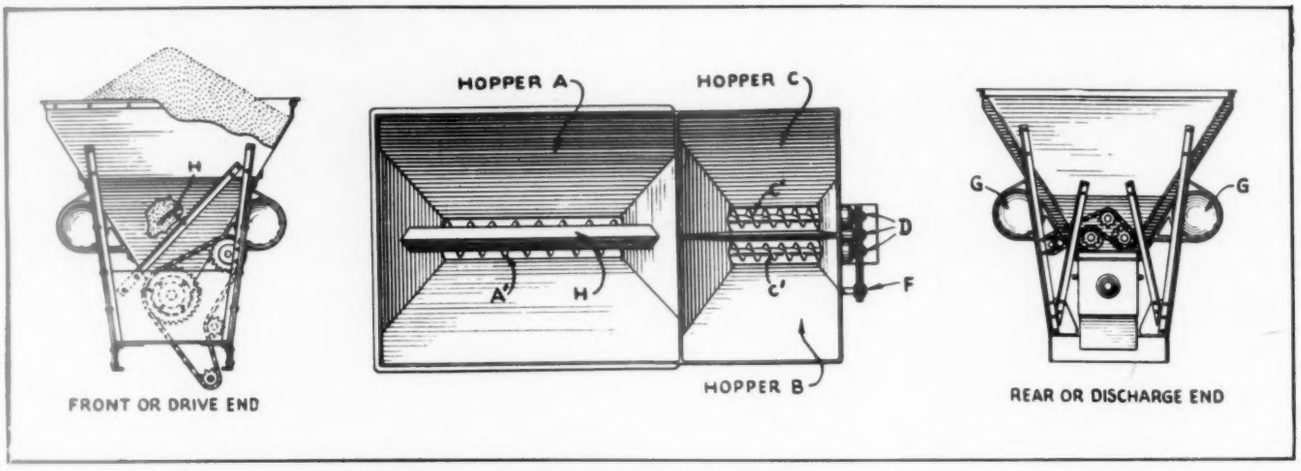
When ready-mixed lime mortar is desired, the aged lime putty is pumped from the tanks by a Carter Humdinger Duplex pump into batch hoppers over two 1-cu. yd. Koehring concrete mixers. The pump is located between the tanks and can be quickly connected to any desired tank by a flexible hose. According to Mr. Miller, this pump easily handles the stiffest lime putty and assures uniform and rapid feed.

The two 1-cu. yd. batch hoppers are of the volumetric wedge-shaped type. Built into one side of each batcher is a compartment open at the top and bottom and formed by a single steel plate welded parallel to the side of the batcher. First the sand is charged into the batcher and forms the bottom of the compartment. Lime putty is then pumped into the compartment, which is graduated so that an exact mixture can be made. When the gate at the bottom of the batcher is opened, the sand draws the lime putty with it as it falls into the mixer. In this way little if any of the lime putty actually comes into contact with the batcher or mixer in its undiluted form. The mortar is mixed for 1 min. and the additional water needed is introduced in the mixer. The mixers discharge the mortar into two receiving hoppers with two compartments of 8-cu. yd. capacity each, which load the trucks. Sixteen Mack trucks with open top, V-shaped, 8 cu. yd. steel bodies are used to deliver the ready-mixed mortar. At the job the mortar is unloaded in 5 or 6 min. by means



View looking down on the two mortar mixers and the hoppers from which trucks are loaded. At left is car in which lime putty is measured into trucks.

The special truck with compartments for sand, cement and lime putty which can be mixed in the truck at the job to any specification and in any quantity.



Three views of the special truck-mixer body. Shown in the center view are the sand, cement and lime compartments with their feed screws.

of a screw-conveyor in the bottom of the truck body. One of these trucks can be loaded in 30 sec. Cement can be included in the mixture but this is usually added at the job by the contractor because of its quick-setting characteristics.

A truck body with six 1-cu. yd. compartments having individual dumping gates is used for delivering aged lime putty to plastering contractors for white-coat finish, because most orders are for 1 cu. yd. of putty at a number of different jobs on almost every trip. This type of body is not entirely satisfactory, so experiments are now being conducted on the delivery of the lime putty in 1-cu. yd. steel or wooden boxes. The regular mortar trucks are also used for the delivery of lime putty to the mason for mixing at the job with his own sand.

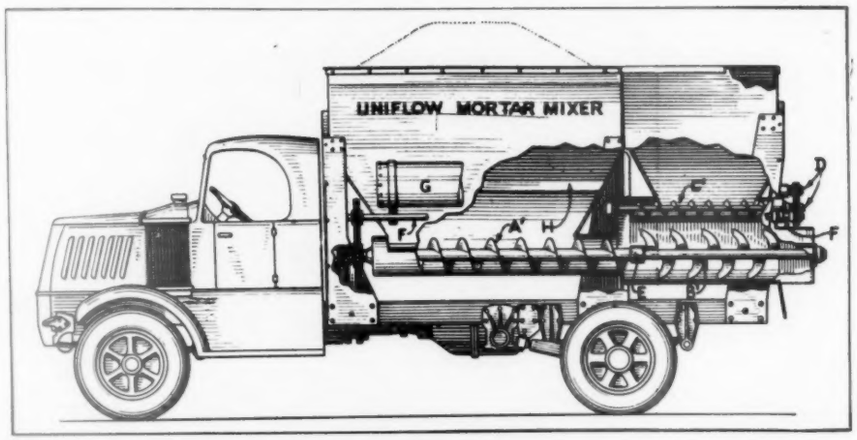
A new type of truck-mixer body invented and patented by Mr. Miller is also being used in the production of ready-mixed mortar. This body, known as the Uniflow, was perfected and built at the Philadelphia plant of the Link Belt Co. The accompanying drawings illustrate its construction. In this V-shaped body there are three separate compartments, a large one (A) for sand and two smaller compartments of equal size, one (B) for lime putty and another (C) for cement in case this is also used. This body transports these putty ingredients to the job, where the mixing is done in the body as the load is discharged. The proportioning of the ingredients is entirely automatic and can readily be changed to give any desired mixture, thus eliminating the inaccurate proportioning usually encountered in job-mixing. With this truck 8 cu. yd. of mortar can be proportioned, mixed and discharged in 5 min. at the job.

Individual feed screws, one in the bottom of each compartment, carry the mortar ingredients into a horizontal pug-mill type of mixer (B^1) which has curved blades designed for thorough mixing. The lime putty and cement screws (C^1) are driven by a chain from a shaft (F) driven in turn by the sand screw (A^1) in such a way that their feed ratios can be changed quickly. A power take-off drive is used. The mixer is driven independently of the feed screws, making it possible for the mixer contents to be discharged after the feed screws have been stopped. This makes it possible to serve a number of small jobs from the truck in one loading and in one trip. According to Mr. Miller, more of these Uniflow mixers are to be added. This same type of mixer is now being designed for a small motor-driven unit for use on the job, where the contractor wishes to mix his own mortar and take advantage of the automatic proportioning features.

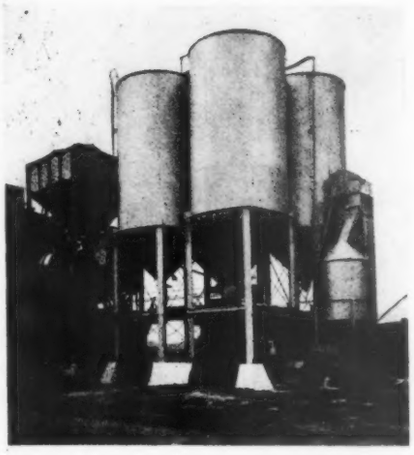
This new lime-putty plant is located on a dock fronting on the East River at the foot of Broadway and Vernon Avenues in Astoria. This dock is also used by the company for the distribution of sand and gravel, crushed stone and ready-mixed concrete. It is about midway between the Queensboro Bridge which gives access to lower and mid-town Manhattan and the Triborough Bridge leading to upper Manhattan and the Bronx. Brooklyn and Queens are also within easy reach.

The quicklime used is a high-calcium, quick-slaking lime obtained from several producers in New England. All the sand is produced by the company. For masons' mortar Cow Bay bricklayers' sand is used. This sand is sharp and clean and has enough fines to make it easy-working. For white coat a white beach sand known as Rockaway Sand is used. This is very even in texture, and, while too fine for masonry work, is ideal for white coat and when troweled produces a hard smooth surface.

Lime-putty and ready-mixed-mortar sales are made for jobs of all types ranging from the Radio City group of buildings down to the cheapest type of one-family veneer brick building in the outlying sections of Queens and the Bronx. Before the Brooks-Taylor plant went into operation the monthly production of mortar averaged 4,000 cu. yd. and the production of lime putty



Side elevation of the mortar mixer truck with side cut away to show the feed screws and the mixing compartment at lower right.



Another view of the lime-putty plant with lime elevator and bin above slaker at right.

for both plaster and the masonry uses averaged about 10,000 cu. ft. per month. With this new plant it is possible to deliver 600 cu. yd. daily in addition to 200 cu. yd. from the Bayside plant. At present the sales of white-coat putty form 80 per cent. of the total lime-putty sales.

The entire Brooks-Taylor lime-putty plant was designed and fabricated by the Chicago Bridge & Iron Co. The plant is neat and attractive in appearance and all the steel is coated with Socony aluminum paint. This fall the entire working floor will be inclosed up to the spring line of the aging tanks. It is expected that the heat contained in the putty in the tanks will be sufficient to keep the putty from freezing during the winter and heat will be supplied in the enclosed working space.

The Colonial Sand & Stone Co. now operates 12 material yards in Manhattan, Brooklyn, Astoria, the Bronx. Ready-mixed-concrete plants are located at six of these yards. The company's three sand-and-gravel plants, at Port Washington, Port Jefferson, and Northport, L. I., are capable of supplying the entire retail requirements of the metropolitan area of New York.

In addition to the new Brooks-Taylor lime-putty plant at Astoria the company continues to operate the Bayside vat-type plant, which was previously mentioned. All the aggregates from the sand-and-gravel plants are delivered to its yards and to purchasers by its own fleet of barges and tugboats.

Talc and Soapstone Conditions Improve

Conditions in the talc and ground soapstone industry during 1936 were in general the best since 1929. According to reports received by the Bureau of Mines from producers, sales in 1936 amounted to 216,191 short tons valued at $2,343,171, an increase of 25 per cent. in quantity and 27 per cent. in value over 1935. Increases resulted principally from a greater output of ground material which represented about 95 per cent. of the total production.

The output of talc and ground soapstone in 1936 was obtained from 35 mines operated in 10 states. Talc was produced in California, Georgia, Maryland, New York, North Carolina, Vermont, and Washington; soapstone in California, Pennsylvania, Virginia and Washington; and pyrophyllite in North Carolina.

Form Concrete-Products Firm at Hammond, Ind.

The Instone Co., 4543 Torrence St., Hammond, Ind., has been incorporated with a capital stock of 10,000 shares of $5 par value, to manufacture concrete products and building materials. Myron W. Bradbyer (resident agent, 43 Warren St., Hammond, Ind.), Gertrude S. Bradbyer and Millard F. Sell are the incorporators.

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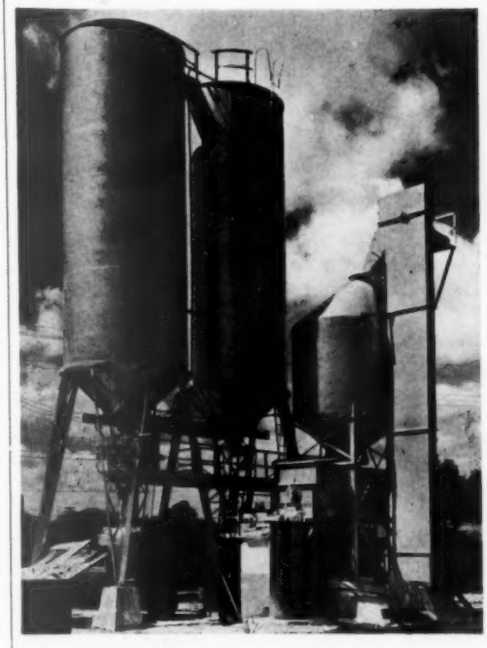

Ready mixed concrete operators and building supply dealers can add a profitable volume of business by supplying their customers with aged lime putty - sanded brick mortar, plaster and white coat.

The accompanying view shows a standard Brooks-Taylor plant for producing aged lime putty operated by the Black-Brollier Company at Houston, Tex. Write our nearest office for full information on the Brooks-Taylor process and a quotation on a standard plant to meet your requirements.

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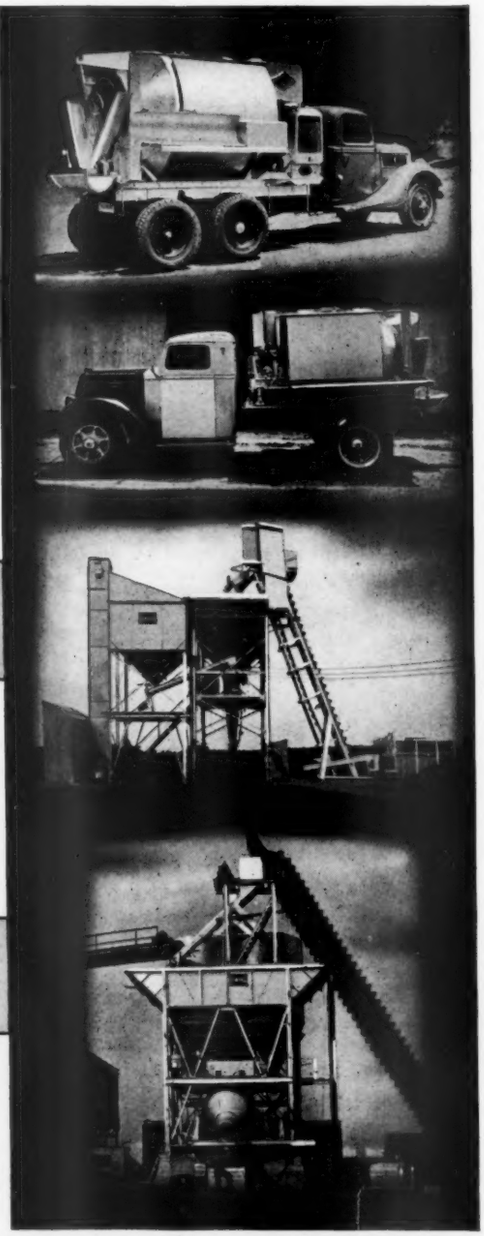

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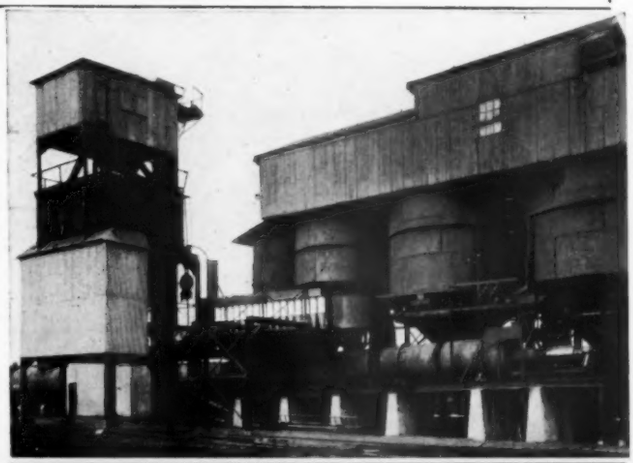

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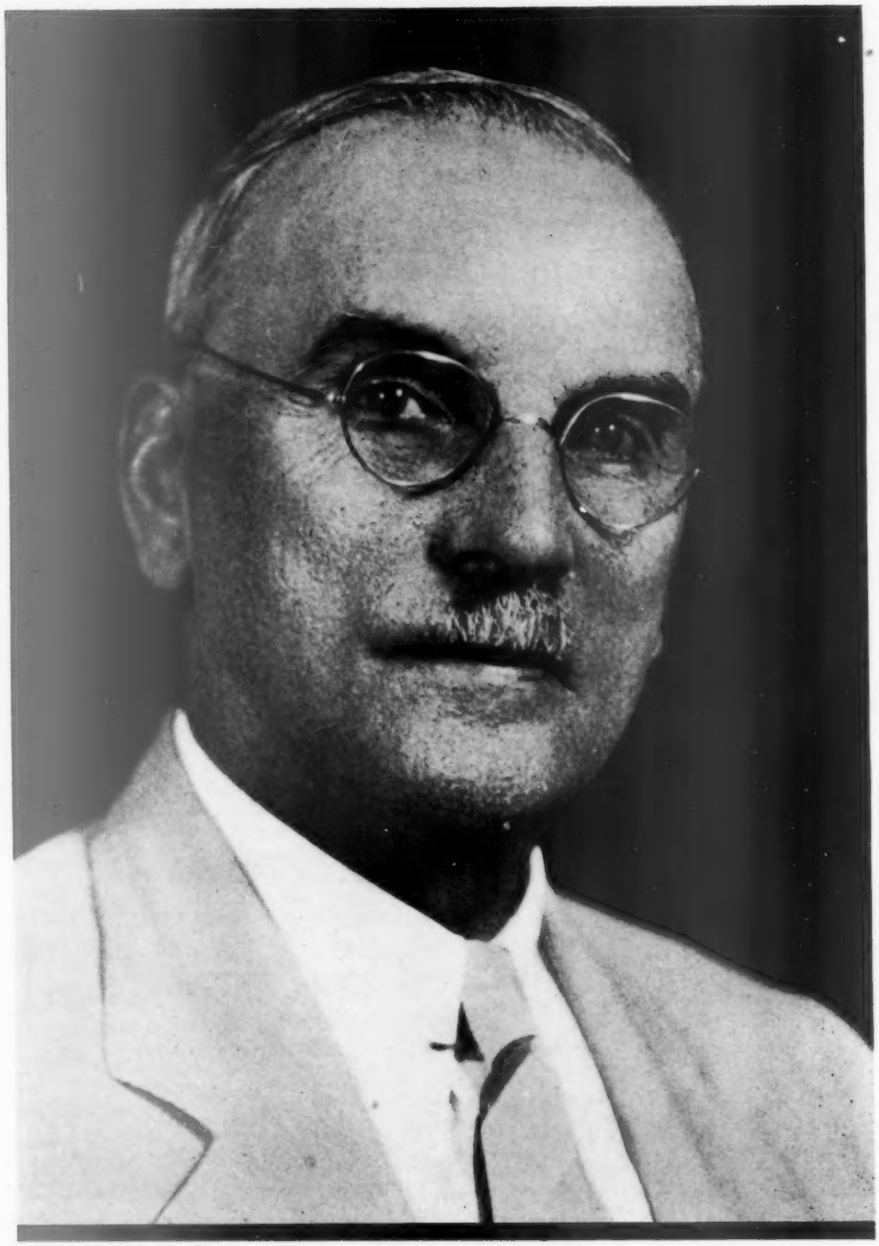

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Chicago, Ill.

MEN • OF • THE • INDUSTRY

Mr. Moyle is one of the real pioneers of the American Portland-cement industry. He was superintendent of the old Williamson & Wilson Portland Cement Co. which turned out the first barrel of the product in Illinois in 1892. This plant was located on the site of the present Marquette operations near Oglesby, Ill. A native of Cornwall, England, Mr. Moyle worked in the tin mines there until he was 18 years old when he came to the United States. With one dollar in his pocket when he landed in New York he obtained a job as stable boy the next day. Next came a period of years working in the iron mines of northern Michigan, the coal mines of central Illinois and his start in the cement industry in 1892. Mr. Moyle was made general superintendent of the Marquette Cement Mfg. Co. in 1923 and vice-president in charge of operations in 1933.

Personal Mention

WARREN W. AYRES of Montclair, N. J., has been elected president of the Lawrence Portland Cement Co., succeeding the late Frank H. Smith. Mr. Ayres, who took office Oct. 1, has been a director of the company for seven years and served as vice-president for the last two years. He has been engaged in banking and finance in New York, N. Y. throughout his entire career and had been a partner in the New York stock exchange firm of Kean, Taylor & Co. since 1925. He severed his connection with that firm Sept. 30 to become head of the cement company.

C. M. HARDY, president of Hougland & Hardy Co., Evansville, Ind., producer of industrial sands, will be one of the speakers at the second annual Iowa Foundry Conference on Oct. 29 and 30 at Iowa City, Ia. He will discuss natural molding sands.

E. CORNING FABER has been appointed to the sales engineering staff of Oliver United Filters, Inc. He has had wide experience in the filtration field and was formerly associated with Filtration Engineers, Inc.

E. H. PAINE of Casper, Wyo., owner of a vermiculite deposit near Encampment, Wyo., intends to open a small plant at Casper in 1938 to process the mineral which is used as an insulating material.

GAIL E. SPAIN, formerly assistant sales manager of the Caterpillar Tractor Co., has been made general manager of the rock-handling division of the Sullivan Machinery Co. He will make his headquarters at Sullivan's Claremont, N. H., plant.

D. R. (Spec) COLLINS, assistant director of promotion, Portland Cement Assn., Chicago, Ill., has resigned to join The Buchen Co., Chicago advertising agency, where he will handle the account of the United States Gypsum Co.

LYLE BALLANTYNE has been named field representative of the Ready Mixed Concrete Co., Omaha, Neb., a subsidiary of the Lyman-Richey Sand & Gravel Co. He will specialize in sales and engineering work.

ERNEST J. DOWNING has joined the Portland Cement Assn. as a member of its accident-prevention and insurance bureau.

CHARLES J. NIESEN has been elected president of the American Silica Sand Co., Ottawa, Ill., to succeed the late William S. Walker. For several years Mr. Niesen had served the company as vice-president and general manager.

O. P. HARRIS, sales manager of the Standard Lime & Stone Co., recently addressed the Kiwanis Club of Wyandotte, Mich., at one of its weekly luncheons.

OTTO A. RAY has been appointed manager of the new Chicago Pneumatic Tool Co. sales and service branch at Salt Lake City, Utah.

H. S. BRIGHTLY has been made director of the technical and field-service division of The Limestone Institute. This division was formerly known as the Building Stone Assn. of Indiana, Mr. Brightly having served it as secretary-treasurer.

C. H. BOENIG of Youngstown, N. Y., has been named sales engineer for the entire western section of New York by the Harnischfeger Corp., Milwaukee, Wis.

R. R. DAVIS, formerly apparatus advertising manager of the Westinghouse Electric & Mfg. Co., has been appointed assistant to S. D. Mahan, general advertising manager.

FRANK O. WYSE, advertising manager of the Bucyrus-Erie Co., was elected president of the National Industrial Advertisers Assn. at the association's annual meeting held Sept. 22-24 in Chicago. CHARLES MCDONOUGH, Combustion Engineering Co., and STANLEY A. KNISELY, Republic Steel Corp., were re-elected vice-presidents, and RICHARD P. DODDS, Truscon Steel Co., and THEODORE MARVIN, Hercules Powder Co., were named new vice-presidents.

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in New Method of Resharpening Bits

Get 100 per cent efficiency from our new, perfected method of resharpening bits, and save enough to justify shipment from any part of the country. Here is what our process does for you at a small fraction of the cost of buying new bits.

Each bit is normalized to take out strains in the steel from previous drilling. It is machined to its original cutting edge and clearance angle, one size smaller in gauge. The bit is hardened by reheating in a Pyrometer-controlled furnace, thereby eliminating guesswork, then it is coated with adhesive oil to prevent rusting and packed in a box marked for size and make.

FREE OFFER: Send us a few of your worn bits. We will recondition and resharpen them and return them to you, good as new, without cost or obligation.

ROCK BIT SALES & SERVICE, INC.
2514 East Cumberland St., Philadelphia, Pa.

A. C. Toner, 56, one of the oldest employees in point of service of the Portland Cement Assn., died Sept. 4 at Chicago, Ill., after an illness of a few weeks. Burial took place Sept. 7 at Baltimore, Md., where he spent his early years. For many years Mr. Toner had charge of the Washington, D. C., offices of the association and later was in charge of the Pittsburgh, Pa., office. In recent years he had been attached to association headquarters at Chicago.

Michael Ross, president of the Ready Mixed Concrete Co. of Kansas City, Mo., producer of crushed stone and ready-mixed concrete, died Aug. 31 after a four-day illness. He was prominent in Democratic politics in Kansas City.

Morgan Curtis, 67, president of the Northern Lime & Stone Co., Petoskey, Mich., died Sept. 10 after a heart attack.

Artemas B. Bigelow, 82, pioneer of the cement industry, died Sept. 7 at his home in Somerset, Pa. He superintended operations at one of the first cement plants built in the East, owned by the Wallkill Cement Co., at Wilbur, N. Y. He helped build the plant of the Vulcanite Portland Cement Co. at Vulcanite, N. J., and for a time served as general superintendent of one of the Alpha Portland Cement Co. plants.

J. G. Kyle, 40, president of the Atlanta Concrete Pipe Co., was drowned Sept. 5 when he fell from a fishing vessel into the Gulf of Mexico about 25 miles off St. Marks, Fla. He was 40.

Hugo Eggers, 39, an employee of the Missouri Portland Cement Co., St. Louis, Mo., who had been missing from his home for three weeks, met his death by drowning in the Missouri River recently. His body was recovered at Boonville, Mo., and identification was made by relatives.

Frank W. Kermott, 78, for many years manager of the Milwaukee Sand & Gravel Co. until his retirement five years ago, died Aug. 29 of a heart attack. He had been associated with sand-and-gravel companies in Milwaukee for the greater part of his life.

Foreign Developments

New Hydrated Ferrite of Lime Is Revealed

The hydration of Brownmillerite C_4AF has been discussed by different authors, among others Lerch and Bogue, according to the reaction:

(1) $4CaO.Fe_2O_3.Al_2O_3 + xH_2O = 3CaO.Al_2O_3.6H_2O + CaO.Fe_2O_3.yH_2O$. Konarzewaki has shown that the monocalcium ferrite can not be hydrated. According to Lerch and Bogue the hydration of the dicalcium-ferrite proceeds so slowly that at the end of two years only 7 per cent. of water is "bound" to the anhydrous salt.

The author is of the opinion that Brownmillerite on contact with water goes through two phases:

(2) $4CaO.Fe_2O_3.Al_2O_3 + xH_2O = 3CaO.Al_2O_3.6H_2O + 2Fe(OH)_3 + Ca(OH)_2 + yH_2O$, the solution being supersaturated with respect to $Ca(OH)_2$;

(3) $Fe(OH)_3 + xH_2O = n.CaO.Fe_2O_3 + yH_2O$.

There should thus exist a hydroferrite of lime at 3 and 4 mol., analogus to the hydroaluminates. During the course of these investigations a hydrate $4CaO.Fe_2O_3.7H_2O$ has been found by Hoffman.

To prove this the author took up again some investigations begun before the war by Rogozinski at the laboratory of Prof. Baikoff at St. Petersburg. A hydrated calcium ferrite was prepared synthetically, by a method described, and submitted to optical studies. Calculations based on the observations leads the author to consider as "almost certain" the existence of a hydrated tricalcium ferrite of the form: 3CaO.FeO.6HO.—Antoni Eiger in *Revue des Materiaux de Construction et de Travaux Publics*, No. 334, July, 1937, pp. 141-142.

Changes in Direction of Cement Research

A review of recent progress and recent investigations on cements and concretes leads the author to the conclusions that:

(1) The principal object up to a short time ago of the chemists who are engaged in the study of cements was to find the compositions most appropriate to assure for their products the highest mechanical strengths, strengths indicated by test specimens at 1, 3, 7 and 28 days. At present, these same chemists are above all preoccupied with obtaining products of more favorable physical characteristics, so that cement structures will have as great resistance, as regards their stability and soundness, even at the end of several years after their placing;

(2) The physicists and the engineers, who have been engaged with concretes only a short time, have demonstrated that particular pains at the time of gauging and the use of special placing methods can yield for concrete constructions a progress even more important than what is still to be expected from the studies of merely chemical nature which could be done on the composition and constitution of the Portland and other similar cements, even considering the recent application of organic catalyst admixtures, during the grinding of the clinker, effected by certain American chemists.—Dr. Vieri Sevieri in *Revue des Materiaux de Construction et de Travaux Publics*, No. 333, June, 1937, pp. 121-125.

Studies on the Thermal Economy of Cement Kiln

The thermal economy of the rotary cement kiln has been the subject of numerous investigations, and in particular the studies on the thermal balance and on the sources of the losses that represent the difference between the theoretical and the practical heat requirements have led to notable mechanical improvements, especially in the utilization of the excess heat. The thermal processes in the kiln itself are the subject of a doctor's dissertation by H. Gygi, manager of a Swiss cement plant (*Thermal Studies of the Rotary Kiln for the Production of Portland-Cement Clinker*, Confederation Technical College, Zurich, 1937). The theoretical results and observations are related to practical observations, and examples of the manner of dimensioning a rotary cement kiln developed. — *Tonindustrie-Zeitung* 61:675-678, August 2, 1937.

Results in Wear Test Dependent on Shape

A study made by Dr. Gieuseppe Cimato for the Italian Touring Club and the Italian Royal Automobile Club shows the dependence of results in the Deval test on stone (in which the wear of stone rotated in a cylinder is measured) on the shape of the stone. Results are only uniform if the shape of the pieces are uniform; a specimen consisting entirely of cubical pieces, for instance, shows results differing from those on a specimen of quarry-run, with a higher proportion of flats or elongated pieces, or from those on a specimen with rounded particles.—E. C. B. in *Pierres et Minerais* 8:55-58, July, 1937.

Maximum Kiln Capacity Not Most Economical

It is sometimes loosely assumed that the economical capacity of a kiln is greatest at the maximum producing capacity of the kiln. This, says a writer in *Revue des Materiaux de Construction et de Travaux Publics* for April, 1937 (No. 331, pp. 85-86), is not correct, because the expenditure of fuel increases considerably with production. The point is illustrated by examples computed according to a general formula and charted in curves.

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FOR SAND, GRAVEL STONE, ETC.
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Traffic News Digest

Recent I.C.C. Decisions

Cement—During the last three years, there has been an enormous increase in highway and building construction in and near South Atlantic and Gulf ports. This will require large quantities of cement which is being divided between domestic and foreign producers. At the hearing in connection with 4th section application No. 16,725, cement to South Atlantic and Gulf ports, it developed that the average delivered price of cement from Belgium, Denmark, Germany and other foreign countries was about 30c. per barrel less than the delivered price of domestic cement in paper bags and 15c. less than the delivered price of domestic cement in cloth bags.

In order to help domestic producers meet this foreign competition, the railroads who are parties to Pope's cement tariff I.C.C. No. 105 proposed to reduce the rate on cement to South Atlantic and Gulf ports by about 19c. a barrel. They ask the Commission for relief from the long- and short-haul clause of section 4, which relief has been denied. In the report, the Commission said that "there is no definite evidence of record that the present domestic prices are unprofitable or that the domestic cement companies are not receiving a fair proportion of the business since those prices became effective. Nor have applicants adequately shown that the proposed rates will result in the movement of sufficient added cement tonnage to offset the proposed reduction in the rates. We find that applicants have not justified the relief prayed for and the application will be denied." I.C.C. FSO No. 12,905.

Ground Limestone—In various cases involving lime and limestone products between central and trunk-line territories a higher basis of rates has been prescribed for shipment between points in trunk-line territory and between points in central territory on the one hand and points in trunk-line territory on the other hand than applies between points in central territory. This difference of rates has in the past been generally established on a percentage basis. For example, the rates on lime from central territory to trunk-line territory are 110 per cent. of the scale of rates applying between points in central territory. The Commission has now handed down a decision covering the rates on ground limestone from Woodville and Gibsonburg, O. to various destinations in central and trunk-line territory in which a mileage scale of rates has been prescribed for application between points in central territory, with the addition of a flat arbitrary of 15c. per ton on shipments into trunk-line territory. In addition to this the Commission has awarded reparation which in some cases involved movements to points which the Commission had formerly found were on a reasonable basis. The prescribed scale for movement in central territory has different rates for single and joint hauls for distances up to 100 miles. For distances more than 100 miles single and joint rates are the same, ranging from $1.40 to $2.10. For distances of 80 to 90 miles the single rate is $1.25, joint rate $1.35. From 90 to 100 miles, the single rate is $1.30, the joint rate $1.35. In view of the principles involved the dissenting report of Commissioner Porter is interesting. In his opinion he said:

"The rates to Indiana points are found unreasonable to the extent that they exceed rates set forth in the appendix. The latter rates are the same as those prescribed in National Mortar & Supply Co. *vs.* Ann Arbor R. Co., 191 I. C. C. 168. In American Lime & Stone Co. *vs.* Pennsylvania R. Co., 201 I. C. C. 467, division 2 said that those rates were on a low basis. Yet here it is proposed to condemn rates to the full extent that they exceed that basis. There is nothing in the report to justify such a conclusion. It will be noted that if the scale prescribed in the last mentioned case were prescribed to 29 of the Indiana destinations it would result in more reductions than increases and the average level of rates to these points would be reduced 16c. per ton.

"To destinations in Pennsylvania, western New York and West Virginia rates are now on practically the basis that was prescribed by division 4 in New Castle Lime & Stone Co. *vs.* Aliquippa & S. R. Co., 173 I. C. C. 593, to apply from Shaw Junction, Pa., to destinations in the same states and in Maryland and later prescribed by division 2 in American Lime & Stone Co. *vs.* Pennsylvania R. Co., supra, to apply from Martinsburg, Millville, and Engle, W. Va., to destinations in eastern trunk-line territory and from Bellefonte and Pleasant Gap, Pa., to destinations in New York. Here the majority propose to use the admittedly low scale to Michigan destinations as a basis and to that add 15 c. to determine the rates to trunk-line territory.

"It will be observed that the rates to trunk-line territory are now substantially on the basis prescribed in American Lime & Stone Co. *vs.* Pennsylvania R. Co., supra. There is no justification for prescribing another scale in this destination territory in view of those already prescribed. As the assailed rates are substantially in line with those previously prescribed I would find them not unreasonable. For the longer distances the rates here prescribed are substantially lower than those prescribed in American Lime & Stone Co. *vs.* Pennsylvania R. Co., supra.

"The majority in no way indicate why an arbitrary of 15 c. added to the Michigan destination scale rates would result in a reasonable basis to destinations in trunk-line territory. The report contains no facts upon which to base the amount of any arbitrary. Conceding that we have frequently prescribed lower rates for application in central territory than in eastern trunk-line territory, we are not justified in setting up a hard and fast differential, trunk line territory over central territory, in this case.

"The majority also award reparation to the complainant, although as pointed out many of the assailed rates are substantially on the basis heretofore approved by us. In instances where we have approved rates or bases of rates it is not conducive to the best interests of either carriers or shippers for us to subsequently award reparation on shipments moving under rates which are substantially on the approved basis. Under such circumstances I think reparation should be denied." I. C. C. Docket No. 27,472 National Mortar & Supply Co. *vs.* P. R. R. *et al*; sub. No. 1, same *v.* same; sub. No. 2, Ohio Hydrate & Supply Co. *v.* same and sub. No. 3, same *v.* same."

Sand and Gravel—Reparation has been awarded on finding that the rate on sand and gravel of 75 c. per ton from Hawarden, Ia.

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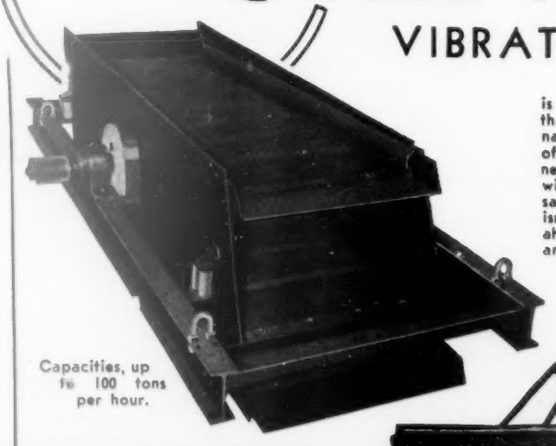

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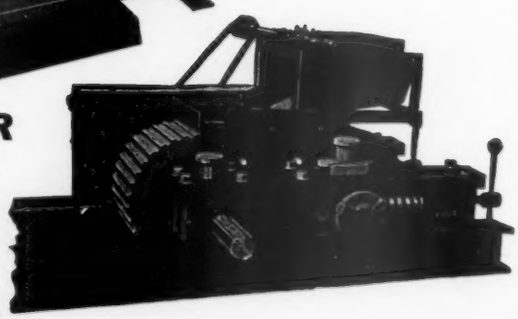
Capacities, up to 100 tons per hour.



ROLL CRUSHER

with Pulsating Feeder that doubles capacity. Improved rib shell construction increases angle of grip and reduces dust.

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to Meckling, S. D. was, is and for the future will be unreasonable to the extent it exceeded, exceeds or may exceed 70 c. I. C. C. Docket No. 27,632 Larson-Erling Co. *v.* Milwaukee. *et al.*

Examiners' Reports

Mineral Wool—Joint board No. 60 recommends that a permit be granted to George H. Prime to operate as a contract carrier hauling feed from St. Louis, Mo. to points in southern Illinois and mineral wool from Salem, Ill. to St. Louis. This proposed report becomes effective at the expiration of 20 days unless exceptions have been filed within that period or the effective date is postponed by the Commission. I. C. C. Docket No. MC 86,146.

Sand—Examiner Burton Fuller recommends an award of reparation on finding that the applicable rate of $4.10 a net ton applying on industrial sand from the Millville, N. J. district to Branford, Conn. between Mar. 25, 1927 and Apr. 22, 1935 was unreasonable to the extent that it exceeded $3.05 per ton in open top cars and $3.25 per ton in box cars. I. C. C. Docket No. 27,732 Malleable Iron Fittings Co. *v.* New Haven. *et al.*

All Commodities—Examiner George Esch recommends that the Commission disapprove the rates published by the Illinois, Central, Frisco, C. & E. I., Wabash and Alton railroads establishing all commodity rates in carloads from Chicago and St. Louis to Birmingham, Ala., published in an effort to meet truck competition. Three minimum weights applied on the proposed rates. The first minimum of 12,000 lb. would take 72 per cent. of the southern first class scale. On a minimum of 25,000 lb. the rate was 57 per cent. of the first class and on a minimum of 40,000 lb. 44 per cent. of first class. These rates were protested by the Birmingham Traffic Assn., Louisville Board of Trade, the Cincinnati Chamber of Commerce, The Southern Motor Carriers' Rate Conference and many of the railroad carriers operating in the southeast. The rates were favored by the St. Louis Chamber of Commerce and Sears, Roebuck & Co. In his report the Examiner said that the establishment of proposed rates would result in violations of sections 2 and 3. I. C. C. Docket No. I&S 4,315 All Freight Chicago & St. Louis to Birmingham.

New Complaints Filed

Cement—Alleging unreasonable rates and charges on cement from Sandts Eddy, Chapman and Hercules, Pa. to Canawaugus, N. Y. reparation is sought in a complaint filed by E. S. Gubernator, Attorney, Young Bldg. Allentown, Pa. in I. C. C. Docket No. 27,855 Lehigh Portland Cement Co. *et al.*, Allentown, Pa. *v.* Lehigh Valley. *et al.*

Sand—Charging violation of section 1 in connection with the rates on sand from Hawarden, Ia. to Baltic, Mitchell and Flandreau, S. Dak. a cease and desist order and reparation are prayed for in a complaint filed by W. R. Wigdon, Commerce Bldg., Sioux City, Ia. in I. C. C. Docket No. 27,831 Western Asphalt Paving Corp., Sioux City, Ia. *v.* Milwaukee. *et al.*

Reparation is sought in a section 1 complaint covering sand from Ottawa, Ill. to Meriden, Conn. filed by Abner Pollack, Practitioner, 1148 Manor Ave., New York, N. Y. in I. C. C. Docket No. 27,836 Charles Parker Co., Meriden, Conn. *v.* Burlington, *et al.*

Traffic News

Emergency Charge Case—It is expected that the Commission will announce its decision in the emergency charge case, Ex Parte 115, early in October. In this case the railroads ask for specific increases on various commodities. After going over income figures for the first half of 1937, the carriers are now considering the advisibility of asking the Commission to allow a general increase in all railroad rates. Any action along this line will probably be withheld until a decision in Ex Parte 115 is announced. The net operating revenue of class I railroads during July 1937 was 2.8 per cent. less than July, 1936 while the net operating income dropped 1.9 per cent. Using monthly averages for the years 1923-24-25 as 100 the figures issued have seasonal variations for 1937 showing a high of 84 per cent. for the month of April with a low of 78 per cent, for the month of June and 80 per cent. for the month of July. A comparison with the July revenues of other years shows 108 per cent. in 1929, 49 per cent. in 1932 and 46 per cent. in 1936.

Rail-Owned Truck Lines—The proposal of Pennsylvania Truck Lines, Inc. to acquire the control of Alko Express line has met with opposition from the National Industrial Traffic League. The league contends that the public is best served by restricting the railroad control of truck lines to operations which are clearly auxiliary to the railroad service such as pick-up and delivery, way-freight or branch line service, or cases where there is no established motor-carrier service.

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WEIGHS ONLY 10 TONS

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Capacity	Model
⅜ yd.	20
⅝ yd. (Truck Shovel)	10
⅜ yd. (Tractor Shovel)	¾ Circle
½ yd.	30
⅝ yd.	38
¾ yd.	45
⅞ yd.	52
1 yd.	62
1¼ yd.	65

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CAPACITIES: 1 to 50 tons per hour.

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New Machinery and Supplies

● Hauling Unit

A new 15-cu. yd. pneumatic-tired "buggy", designed particularly for hauling stone or gravel, is announced by R. G. Le Tourneau, Inc., of Peoria, Ill., and Stockton, Cal.

This new model except for capacity, is very similar to the Le Tourneau 24- and 30-cu. yd. buggies. In unloading, the body moves backwards over the bed, pushing the load through an ever-widening opening to the rear, so the wheels do not travel over the material as it is unloading. Extended this opening is 7 ft. 10 in. by 9 ft. 10 in.—large enough to make easy the unloading of bowlders. Unloading takes less than a minute and can be accomplished on the move.

The 15-cu. yd. pneumatic-tired "buggy".

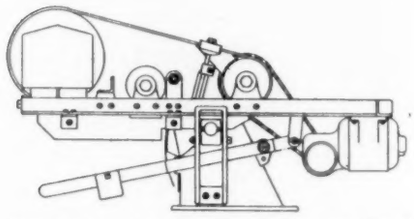
Its big tires keep it on top of soft going, its light draft makes tandem operation practical if desired. It is constructed of alloy steel, arc-welded throughout. The bottom is wood-filled and stoutly reinforced for handling the most punishing of loads. It has a struck measure capacity of 11.84 cu. yd. and a heaped measure capacity of 15 cu. yd. Weight is approximately 14,500 lb. It is built for use with Caterpillar RD7 and RD8 tractors.

● Improved Feeder

The Hardinge Co., Inc., of York, Pa., announces an added feature to its constant weight feeder, which adds new uses to the others it is performing so successfully.

This was accomplished by equipping the feeder with a standard magnetic pulley, which would remove all magnetic substances, such as tramp iron and steel, from materials to be fed from a bin to such units as grinding mills, driers, mixers and kilns, and feed and weigh them, prior to processing.

The constant weight feeder differs, in principle, from other feeders, in that it feeds by weight and not by volume. Thus it actually increases process capacity 10 to 20 per cent., eliminates lost tonnage due to changes in weight per cubic foot, bulking or segregation. Now, the newly-arranged unit performs another function and accomplishes very real results, without having to install separate magnetic pulleys beyond the feeder. The unit illustrated is obtainable for capacities ranging from a few pounds per hour up to 200 tons an hour, and for feeding fine materials as well as lumps up to 4 or 5 in.



Sketch of constant-weight feeder equipped with magnetic pulley.

Wiring to the motor is separate from that to the magnetic pulley, as the magnetic pulley operates on direct current from a separately excited direct-current generator, or local direct current if available. The feeder is furnished either a.c. or d.c., whichever is standard in the individual plant.

● Calcium Stearate

The Reardon Color & Chemical Works, 836 Reedy St., Cincinnati, O., announces the perfection of a process for making calcium stearate in bead form. The new material is now being marketed. Steps to perfect patents are under way. Calcium stearate is recommended in the reports of the U. S. Bureau of Standards for waterproofing cement and it is used in cement manufacture.

The advantages claimed for the Reardon process of making calcium stearate in bead form are:

(1). An increase upon analysis in the true calcium stearate to 95.1 per cent. This is higher than in the powdered form.

(2). Reduction of approximately 25 per cent. in price.

(3). The beads are about 1/8 in. in diameter, very irregular in shape, and are fed into the grinding mill with the cement clinker. There is practically no mixing cost.

(4). Because of their irregular shape, the beads tend to travel along with the clinker and insure a more uniform dispersion than is possible with a dry powder. The beads thus become thoroughly inter-ground with the cement.

(5). The beads are absolutely dustless, and increase operating cleanliness and convenience.

● Pumping Unit

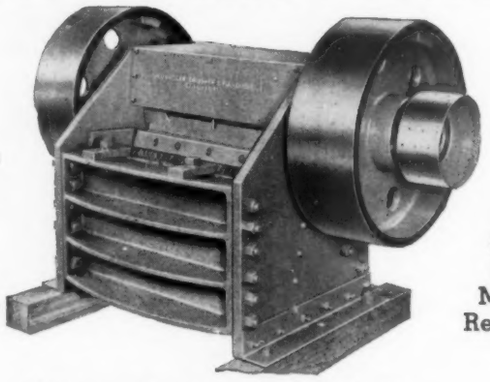
A two-stage built-together pump (pump and motor built together) has been developed by Fairbanks, Morse & Co. to operate against heads up to 500 ft.—higher than could be handled by a single-stage unit. In many applications it offers a less expensive alternative for multi-stage and split-case pumps, and its compactness and sturdiness qualify it for portable and semi-portable as well as stationary service.

The new F-M pump is well adapted for all classes of general pumping service. Because of its compact design, the pump is especially advantageous where space is limited. No special foundation is required; the pump is complete in itself and can be mounted in any convenient horizontal, vertical or angular position. Installation is extremely simple.

This new built-together pump, entirely designed and built in one factory, consists es-

LOW COST CRUSHING FOR 52 YEARS

Save 90% in Lubrication Costs and Insure Minimum Maintenance



A Size Crusher Built to Meet any Requirement

"One Reduction" Roller Bearing Jaw Crushers For producing uniform cubical material . . . . free of flats and chips.

Write for illustrated Bulletins on Complete Crushing Equipment. Also our Stationary and Portable Rock & Gravel Crushing & Screening Plants.

GRUENDLER
CRUSHERS - PULVERIZERS - GRINDERS

GRUENDLER CRUSHER & PULVERIZER CO.
2915-21 N. Market St., Dept P. Q., St. Louis, Mo.

Motor-pump unit operates against 500-ft. head.

sentially of a two-stage centrifugal pump, with enclosed bronze impellers, mounted directly on the shaft of an F-M splash-proof motor. There are no flexible coupling or alignment problems with which to contend. Two rugged ball bearings, an electric motor construction feature pioneered by Fairbanks-Morse many years ago and later adopted by other manufacturers, take all of the radial and unbalanced thrust loads. Impellers for the two stages are placed back to back, compensating thrust. Improved hydraulic design is atained by placing the first stage unit next to the motor and the second stage on the outside, simplifying the cross-over passage and placing the stuffing box under suction instead of pressure. A mounting leg under the pump end gives the unit added stability.

● Multi-V-Belt

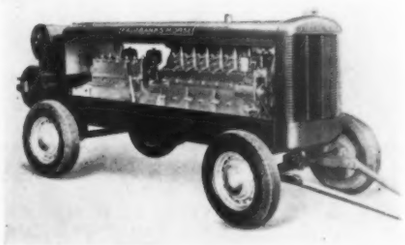
Hailed by designers as the closest-matched multiple V-drive belt yet achieved, the new E-C Cord multi-V belt has been announced by the Goodyear Tire & Rubber Co., Akron, O.

Precision-built, the close matching of the belts used in multiple, it is pointed out, equalizes the strain and load-carrying on all the belts of the assembly, prolongs their life, and produces a better and more efficient drive.

The load on the new belt is carried entirely by a layer of heavy low-stretch, high-tensile cord, placed in a neutral section between rubber high tension and high compression sections. Surface wear is taken by an elastic fabric envelope with the weave on the bias. Such construction, along with close matching, make the E-C Cord multi-V Belt the best Goodyear has ever produced, designers say.

● Diesel Compressor

Fairbanks, Morse & Co. has announced a new self-contained, Diesel-powered, 210-c.f.m. air compressor, available with several types of portable and semi-portable mountings, for a wide range of service applications. This new compressor combines the economy and dependability of the F-M Model 36-A Diesel with the superior design features of a proved air compressor, making available a compact, light-weight unit that offers maximum efficiency and absolute reliability under all working conditions.



Diesel-powered portable air-compressor.

Through the proper application of modern engineering design, the compressor unit has been kept light in weight and small in size, contributing to its portability. Ample bearing surfaces and proper lubrication make possible a long trouble-free life. The water cooling system assures thorough and uniform cooling in any climate and under any condition. Low upkeep expense results from the employment of refinements of proved automotive engine design.

The compressor is designed to operate at full engine speed, permitting direct-connection to the engine without reduction gears or belts and without sacrificing engine horsepower through reducing the rated speed.

● Excavator

The Koehring Co., Milwaukee, Wis., announces a new ¾-cu. yd. shovel, Model 303. It is a high-speed, light-weight machine, designed according to the latest developments and progress of engineering skill. Heavy-duty construction has been employed throughout. The use of high strength special steels, combined with welded construction and simplified design has produced a machine of exceptional strength, with a substantial decrease in weight.

The 303 is fully convertible, with a 1-cu. yd. rating as a crane or dragline. Attachment changes are easily and quickly made on the job. Easy operation is an outstanding advantage. A simple gear shift provides two selective swing speeds to synchronize with the arc of swing and height of lift for increased output. Two traction speeds give greater power in tough going and faster speed in easy traveling. Positive steering for any angle is easily accomplished from the lever position in the cab. Full vision from the cab

Hi-power ...the Bucket for Excavating

Contractors say "It's the best bucket we've ever used" . . . because it digs deep, fills full and stands up! It will dig BIGGER PAY LOADS for you.

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George Haiss Mfg. Co., Inc., 142nd & Rider Ave., New York

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A better job at lower cost

From river to washing screens through 5,000 feet of Taylor Spiral Welded Pipe.

FOR dredging lines, pontoon lines, sand and gravel lines, water lines—any service where a light-wall pipe is suitable—Taylor Spiral Welded Pipe will perform that service with half the weight that would be required if standard wrought steel pipe were used. This lighter weight means lower first cost, lower shipping costs, lower installation costs. Yet Taylor Spiral Pipe gives surprisingly long wear. There is a size and gauge for every light-walled pipe service—with protective coatings to meet any condition.

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New York Office: 50 Church St. Pittsburgh Office: Gulf Building

TAYLOR Spiral PIPE

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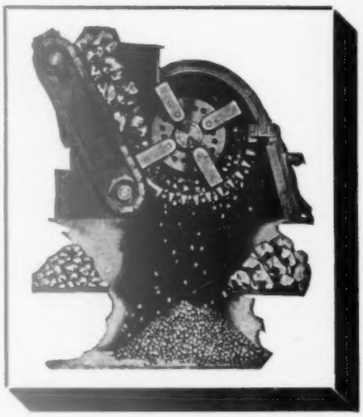

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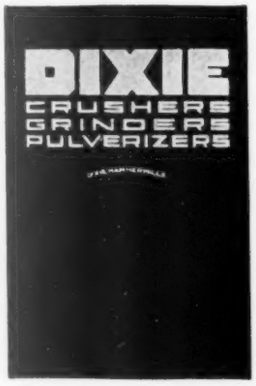
• is the only crusher with a super-tough moving breaker plate that is 26 times the average area. The result is maximum crushing power with minimum maintenance. That is why DIXIE gives record low costs in producing uniform, cubical material.

Built in 40 different sizes for all requirements in Primary, Secondary and Fine Reduction. Write for your copy of the Dixie Catalog, which gives full details and specifications.



DIXIE MACHINERY MFG. COMPANY

4209 Goodfellow Ave., St. Louis, Mo.

New model 303 shovel equipped with ¾-cu. yd. bucket.

operating position assures maximum production. Safety glass protects the operator. Convenient and free accessibility of all parts is a definite time-saver when adjustments are necessary. Each shaft can be independently removed. Drums are equipped with quickly removable barrels. Gears are enclosed and run in oil bath. Anti-friction bearings eliminate power waste.

• Tires and Tubes

A new line of heavy-duty commercial truck tires and tubes designed especially for light trucks of ½- and ¾-ton carrying capacity is now being manufactured and sold by the B. F. Goodrich Co., it is announced by J. J. Newman, vice-president and general manager of the company's tire division. The new tires are recommended for both original equipment and replacement purposes.

The new line is manufactured in a complete range of sizes to fit present equipment rims in 16 inch wheel diameters. These sizes are 6.00-16; 6.50-16; 7.00-16; and 7.50-16. All are made with six plies, while the last is also made with eight plies. According to the Goodrich announcement, this new tire is the answer to a popular demand for "truck tires for truck service" even on ½- to ¾-ton trucks where formerly passenger tires were usually the only type available.

• Admixture

The use of a newly-discovered dispersing and catalytic agent known as TDA in Portland cement results in a concrete of greater workability which hardens rapidly and after hardening has a fine, uniform structure, homogeneous throughout. According to the Dewey & Almy Chemical Co., Cambridge, Mass., which developed it, TDA by its dispersing action prevents agglomeration of the cement particles during the mixing process. This effect is enhanced by the catalytic action of TDA so that hydration is more rapid and bleeding is reduced.

Since "bleeding" is responsible for water gain under the aggregate in concrete, this means that concretes made from the new cement are far more impermeable and free from channeling, with resultingly greater resistance to the ravages of freezing and thawing. Tests also show that the bond between the cement and the aggregate is much stronger when no water voids are formed under the aggregate during the hardening period.

• Classifier

The Nordberg-Wood auto-vortex bowl classifier was developed by the Nordberg Mfg. Co., Milwaukee, Wis., to meet the demand for a machine to recover very fine sand (minus

A 15-year record of repeat business would imply that sound Parsons engineering is worthy of *your* investigation, too. Parsons' patented oval bag principle, long life, low dust count and minimum maintenance enable Parsons Dust Arrestors to excel in the cement industry. Write for our Bulletin DA-6.

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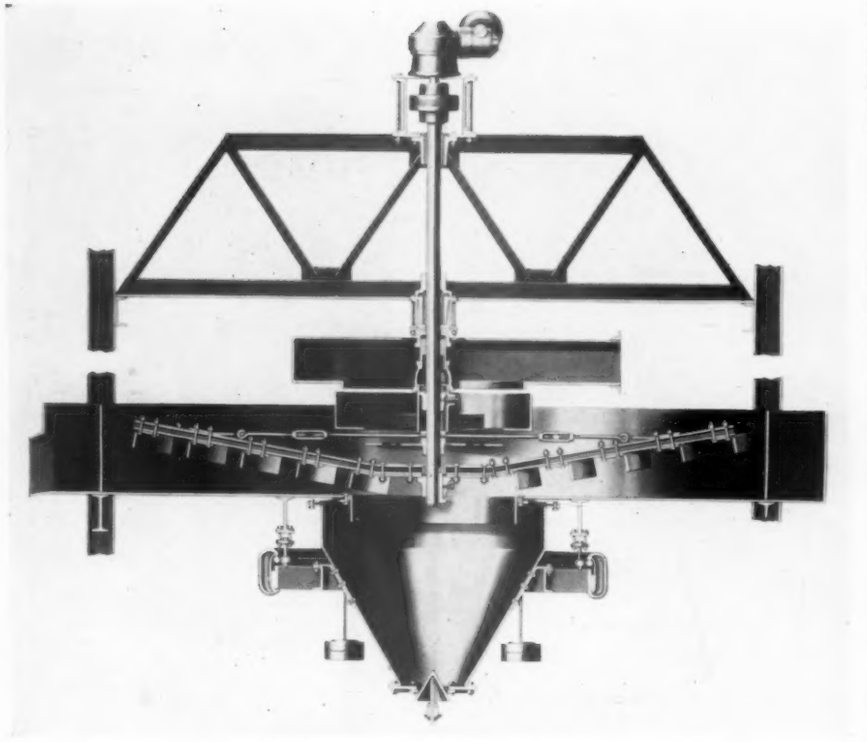


Cross-section of the bowl-type classifier.

50 to 100 mesh) from large volumes of water and at the same time overflow the silt or clay. In addition to this feature, it also possesses the advantages of the auto-vortex cone classifier; namely, reliability, light weight, low head room, and economy in first cost and operation.

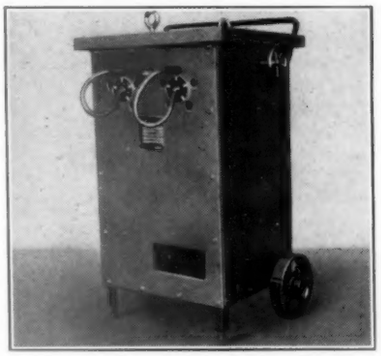
This machine has the same conical-shaped hopper carried in a lever mechanism as is used for the cone-type machine, except that the revolving cylinder has been omitted. Above this and carried on separate structural supports is the large area bowl and rake mechanism. The hopper is connected to the bowl by a rubber diaphragm, allowing full movement to the hopper when discharging. The rake is motor driven from above, has four arms, and moves the settled material in the bowl toward the center where it passes into the hopper. The feed entering through the feed spout discharges into a freely revolving cylinder located above the rakes. The heavier particles settle into the bowl and are eventually discharged through the valve at the bottom of the cone, while the water carrying the silt and clay overflow into the launder surrounding the bowl and is carried away through the discharge spout.

● Arc Welder

A 150-amp. a-c. transformer type arc welder has been added to the extensive line of machines manufactured by the Wilson Welder & Metals Co., Inc., New York, N. Y.

With the addition of the new model, there are now available a.c. arc welders in capacities of 150, 300, 500, 750 and 1000 amp. All are complete and self-contained units and need no other accessories, except the welding cable, electrode holder and hand-shield.

Recently redesigned, the entire line has an excellent appearance, and in internal arrangement and selection of materials, each is constructed especially for rough, hard shop usage. One of several distinctive features incorporated in the machines includes a system of three controls or adjustments of the welding current. Through the medium of the first two controls it is possible to obtain 25 coarse ad-



New 150-amp. alternating-current arc-welder.

justments. The third control offers a further and finer adjustment of current values within any one of the fore-going twenty-five. By means of these three controls an infinite number of settings may be secured.

● Sand Pump

Wide adaptability, reliability, and simple construction, coupled with low-cost installation and maintenance, are features said to characterize the new sand pump developed recently by the Victor Equipment Co., Kimball-Krogh Pump Division, San Francisco, Cal. The new unit, known as Model 100, offers small capacity, moderate heads, and is designed to handle mill tailings, sands and other fine gritty material. Each pump is fitted with the

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Complete Plants Designed and Equipped.
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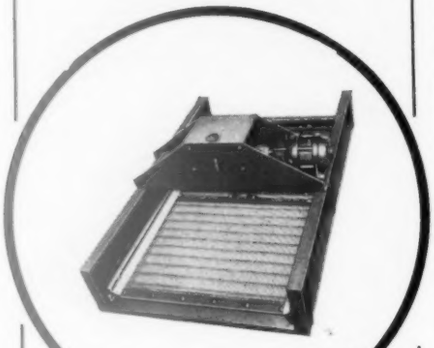
Fine Screening
by THE Leahy



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Patented differential vibration, giving efficient action over entire working surface of screen, assures utmost uniformity of grading, economy of operation and low maintenance. Write for Bulletin of available types and sizes.

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Proved PERFORMANCE

Money-making performance can be expected of Jeffrey material handling and reduction equipment wherever it is used. For Jeffrey has been building processing and handling equipment for the stone products industry since 1877. Reflecting this long experience and up-to-the-minute engineering . . Jeffrey-built crushers, elevators, conveyors, feeders, chains, screens, washers, loaders and unloaders assure steady output, a finished product of uniform quality.

For the sake of economy and efficiency . . for maximum freedom from costly and annoying maintenance problems in processing and handling . . call on Jeffrey engineers. They rely on experience.

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THE JEFFREY MFG. COMPANY
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Kimball-Krogh wear take-up. The oversize shaft is of carbon steel and threaded both into the impeller and on the opposite end to permit adjustment for wear.

As known, the principal wear occurs on the hard-metal wear nozzle and impeller hub, the gradually increasing clearance resulting in a corresponding decrease in pump capacity. This difficulty is said to be quickly overcome by adjusting the wear take-up at the drive end of the shaft. The wear nozzle and impeller can be removed and replaced without first disassembling the pump or bearing assembly by simply removing the suction flange. The pump case is of cast iron with thick walls to assure maximum wear, and the impeller and wear nozzle are made from chrome-nickel steel. A rubber-lined bearing and an iron lantern ring are incorporated in the design of the stuffing box. To protect the shaft and bearings a small quantity of water or solution is supplied to the lantern ring at a pressure equal to that of the discharge head. The main bearings are of the ring oiling type, each containing two oil rings. Pump base and bearing case are cast in one piece, and the pump body proper, held to the bearing housing by a split clamp, can be turned to any position of discharge. The new pump is made in sizes up to 2½ in.

● Drifter Drill

The Ingersoll-Rand Co., New York, N. Y., has recently introduced a new drifter drill called the DA-30. It is in the 125-lb. class,

The DA-30 drifter with auto-feed and jack-bits.

and is ideal for many mining and quarrying operations.

A new double-opening valve has greatly increased the drilling speed without increasing the air consumption.

This new drill has proved to be equally as popular as its bigger brother, the DA-35 which was introduced in 1936.

New lime-putty plant of Ever-Ready Mixed Mortar, Inc., which recently began operating at Houston, Tex. It is one of the many installed in the past year or so under Brooks-Taylor patents. This is said to be the first installation west of the Mississippi River.

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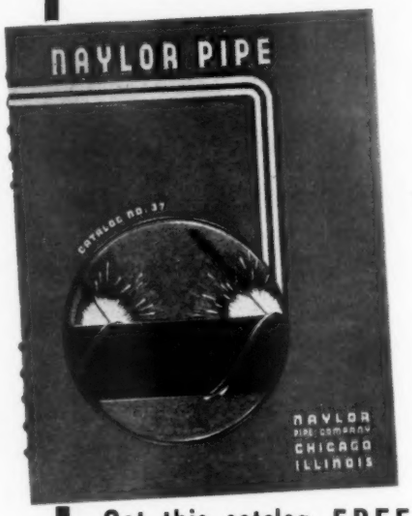
ON YOUR PIPE LINES



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No other light-weight pipe offers you the strength, the flexibility, the safety and the stamina of Naylor Lockseam Spiralweld Pipe. These factors cut performance costs on water, sand and gravel lines.
Sizes from 4" to 30" in diameter. Thickness from 14 to 8 gauge. All types of fittings and connections available.
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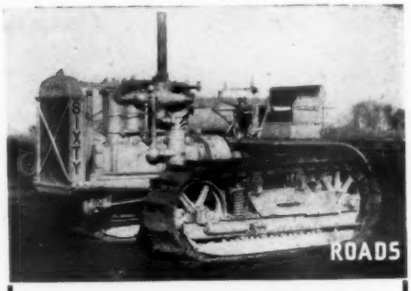

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INCORPORATIONS

CONTINENTAL ROCKWELL CORP., Wabash, Ind. Capital: 1,000 shares n.p.v.

MCCORMACK SAND & GRAVEL CORP., 21 East 40th St., New York, N. Y., Capital: 1,000 shares n.p.v. Correspondent: Jacob I. Goodstein, 21 East 40th St., New York, N. Y.

PYROPHYLITE TALC PRODUCTS, INC., Glendon, N. C. Capital stock $50,000.

CITY CEMENT BLOCK CO., INC., Bridgeport, Conn. Capital: $20,000.

ASHLAND GRANITE QUARRIES, INC., Ashland, Ore. Capital: $125,000.

THE NEWMANN GRAVEL CO., Weston, Conn. Capital: $50,000.

KANKAKEE SAND CO., Kankakee, Ill. Capital 300 shares.

HOLLINS STONE CORP., Hollins, Va. Capital: $12,000.

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NATIONAL MARBLE & TILE CO., Newark, N. J. Capital: 2,000 shares n.p.v.

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MURPHY & PERKINS READY-MIXED CONCRETE CO., Oklahoma City, Okla. Capital: $10,000.

THE RIVER BEND SAND & GRAVEL CO., Salem, Ore. Capital: $10,000.

Trade Literature

Truck, Bus, Tractor Operators Handbook. 66 p. B. F. Goodrich Co., Akron, O.

SKF Drill Steel. 44 p. SKF Steels, Inc., New York, N. Y.

Skinner Pipe Repair Clamps. (Folder), M. B. Skinner Co., South Bend, Ind.

Bristol's Pyromaster Potentiometer. (Folder), The Bristol Co., Waterbury, Conn.

Columbia's JFS-Jr. Vari-Speed Control. 4 p. Columbia Vari-Speed Co., Wheaton, Ill.

A. B. C.'s of Manganese Steel Welding. 12 p. Stulz-Sickles Co., Newark, N. J.

Austin-Western No. 100 Portable Crushing and Screening Plant. 12 p. Austin-Western Road Machinery Co., Aurora, Ill.

Concrete Pipe Machinery. 16 p. Universal Concrete Pipe Co., Columbia, O.

The Importance of Thoroughly Dependable Wire-Rope Fastenings. 20 p. American Hoist & Derrick Co., St. Paul, Minn.

Hard-Facing with Haynes Stellite Products. 104 p. Haynes Stellite Co., Kokomo, Ind.

Weight at a Glance with a Merrick Weightometer. 24 p. Merrick Scale Mfg. Co., Passaic, N. J.

Bay City Excavators—Models 30, 32, 38, 42 and 45. (Five 4-p. leaflets). Bay City Shovels, Inc., Bay City, Mich.

Perforated Metals. 24 p. Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Model 36-A Diesel Generating Sets. 16 p. Fairbanks, Morse & Co., Chicago, Ill.

The Super 40 Roll Crusher. 4 p. Pioneer Gravel Equipment Mfg. Co., Minneapolis, Minn.

Atlas Conveying Equipment. 12 p. Atlas Conveyor Co., Clintonville, Wis.

Austin-Western 5-Yard Tractor Scraper. 8 p. Austin-Western Road Machinery Co., Aurora, Ill.

Valves for the Cement Industry. 12 p. Merco Nordstrom Valve Co., Pittsburgh, Pa.

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Complete with ONE Unified Responsibility

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EIGHTH ANNUAL CONVENTION AND EXPOSITION
NATIONAL READY MIXED CONCRETE ASSOCIATION

NETHERLAND PLAZA HOTEL,
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January 31, Februrary 1, 2 and 3, 1938

The program will be a practical one devoted to the practical problems of the two industries. All who are interested in sand and gravel and ready mixed concrete are cordially invited to be present.

NATIONAL SAND AND GRAVEL ASSOCIATION
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new 303 KOEHRING

Again, a completely new excavator by Koehring—ultra modern in design—speedy operation — economical in upkeep. Enclosed gears, anti-friction bearings, high line speeds, and selective swing speeds are important profit-earning features. The new Koehring 303 is a ¾ yard shovel and a 1 yard dragline or crane, fully and quickly convertible.

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3026 WEST CONCORDIA AVENUE, MILWAUKEE, WISCONSIN

Announcement

Twenty-First Annual Convention National Crushed Stone Association

Netherland Plaza Hotel Cincinnati, Ohio

JANUARY 24, 25 and 26, 1938

In conjunction with which will be held

THE MANUFACTURERS' DIVISION EXPOSITION OF MACHINERY, EQUIPMENT, AND SUPPLIES

THE Annual Convention of the National Crushed Stone Association, during the years since its inception, has become recognized as an event of outstanding significance to crushed stone producers individually and to the industry as a whole.

It serves, as no other medium can, to develop, crystallize, and express industry opinion. It signifies solidarity of purpose and the ability of those engaged in the same line of activity to unite in the solution of common problems.

As individuals, producers will find much to reward them for a visit to Cincinnati next January: Speakers of outstanding reputation and experience will discuss problems of timely interest, both technical and legislative; opportunity will be afforded for the mutually beneficial exchange of opinions with fellow-producers, to say nothing of the pleasure to be derived from renewing old acquaintanceships; the Manufacturers' Division Exposition will command studious attention for the helpful suggestions to be obtained from an inspection of the latest developments and improvements in machinery and equipment used in the crushed stone industry.

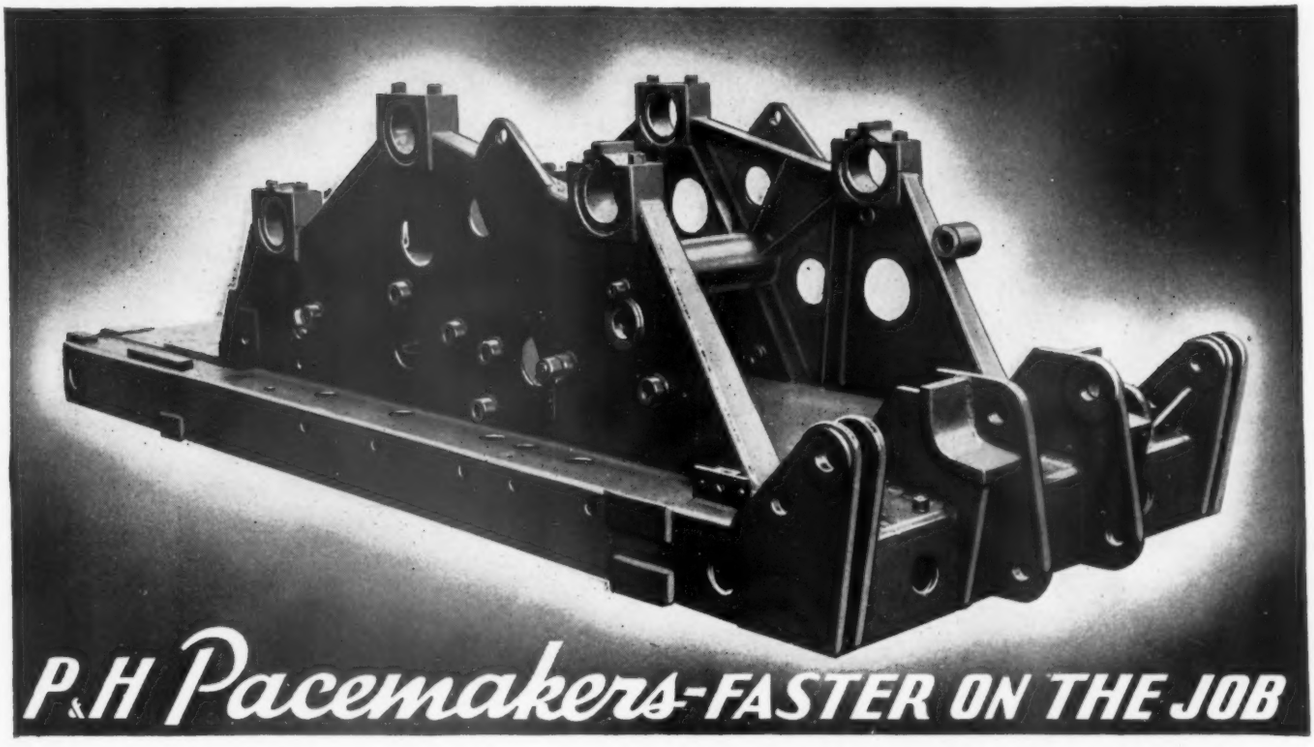
All crushed stone producers of the United States and Canada, whether or not members of the National Crushed Stone Association, are cordially invited to attend our Twenty-first Annual Convention. Make your plans now to be present at Cincinnati on January 24, 25 and 26, 1938.

1918 National Crushed Stone Association 1938

1735 Fourteenth Street N. W. Washington, D. C.

"It's a pleasure to operate a P&H, I really get the dirt."
D. E. Corbett.

THIS IS THE MOST ADVANCED CONSTRUCTION in the Shovel Industry —



In no other excavators will you see engineering progress carried to the extent found in these modern P&H Pacemakers. Greater strength is built in with all-welded construction of alloy steels—clumsy dead weight is stripped off to gain higher digging speeds and lower operating costs. Offered in all sizes from 3/8 to 5 cubic yards, the P&H Pacemakers are setting new records for low-cost dirt moving. For information on the size you need, address the Harnischfeger Corporation, 4451 W. National Avenue, Milwaukee, Wisconsin..

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Pit and Quarry Handbook (including the Directory of Cement, Gypsum, Lime, Sand, Gravel and Crushed-Stone Plants). 1936 ed., 792 pages, 8½ x 11½, 447 ill., 39 charts, 94 tables, cloth. Complete, concise and conveniently arranged technical reference work on all phases of designing, operating and maintaining nonmetallic-mineral producing and manufacturing plants (cement, lime, gypsum, sand-and-gravel, crushed-stone, aggregates-bituminizing and ready-mixed-concrete). Accepted the world over as the standard authority.

Pit and Quarry Directory. (The Directory Section of the Handbook, published separately). Complete alphabetical and geographical lists of nonmetallic-mineral producing and manufacturing companies and their plants. 1936 ed., 254 pages, 8½ x 11½, paper.

Materials Handling Equipment. By Edward J. Tournier, estimating engineer, Robins Conveying Belt Co. 371 pages, 6x9; 146 ill. Sets forth the results in service of those mechanical-handling devices generally used and indicates the methods by which a proper selection may be effected. An invaluable guide to economical equipment purchasing.

Portland Cement. By Richard K. Meade. Third edition; revised and enlarged; XII+707 pages, illustrated. The composition, raw materials, manufacture, testing and analysis in the Portland cement industry.

Non-Metallic Minerals. By Raymond B. Ladoo. 686 pages, 6x9, 50 diagrams. A comprehensive book on the composition and properties, methods of mining and preparation, market values, extent and nature of markets, specifications and tests and uses of all non-metallic minerals of commercial importance, except fuels and natural bitumens and hydrocarbons.

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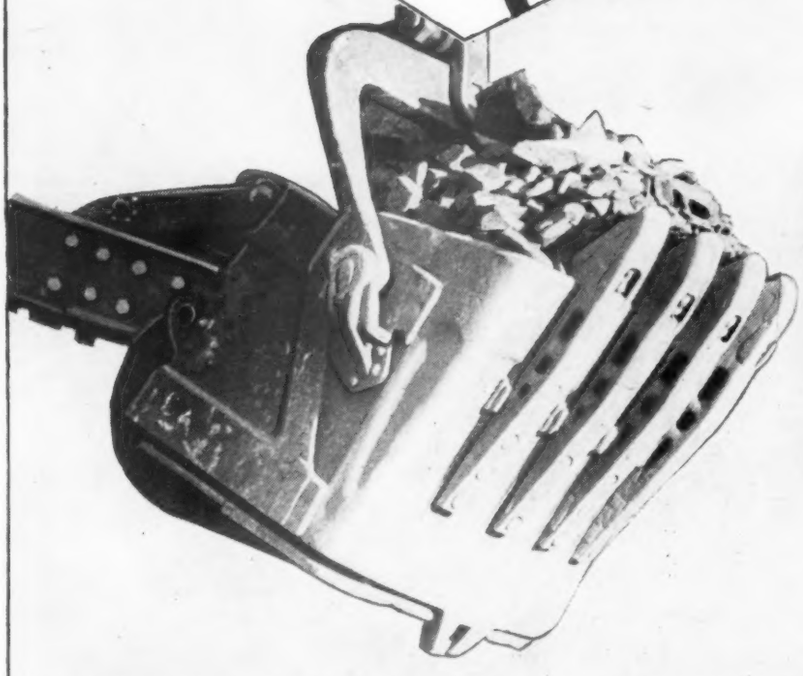

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BUYERS' GUIDE

A Directory of Pit and Quarry Advertisers Indexed According to Product.

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Republic Rubber Co.
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Republic Rubber Co.

Belt Lacings
Flexible Steel Lacing Co.

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*Blaw-Knox Co.
Jaeger Machine Co.

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*Harnischfeger Corp.
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*Koehring Co.

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*Sprout, Waldron & Co.

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*Leschen & Sons Rope Co., A.
*Link-Belt Co.
*Sauerman Bros., Inc.
*Wickwire Spencer Steel Co.

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Easton Car and Const. Co.
*Koehring Co.

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*Robins Conveying Belt Co.
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Haiss Mfg. Co., Geo.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Sprout, Waldron & Co.

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*Hendrick Mfg. Co.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
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McLanahan and Stone Corp.
Patterson Fdry. & Machine Co.
*Robins Conveying Belt Co.
*Sprout, Waldron & Co.

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Bradley Pulverizer Co.
*Deister Machine Co.
*Hardinge Co.
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*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
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*Link-Belt Co.
*Nordberg Mfg. Co.
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*American Steel & Wire Co.
*Leschen & Sons Rope Co., A.
*Wickwire Spencer Steel Co.

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*Jeffrey Mfg. Co.
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*Sprout, Waldron & Co.

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*Hardinge Co.
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*Traylor Engr. & Mfg. Co.
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Concentrators (Slurry)
*Deister Concentrator Co.

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Independent Pneu. Tool Co.

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*Jaeger Machine Co.
*Koehring Co.

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Universal Concrete Pipe Co

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Iowa Mfg. Co.
*Link-Belt Co.
Smith Engr. Works

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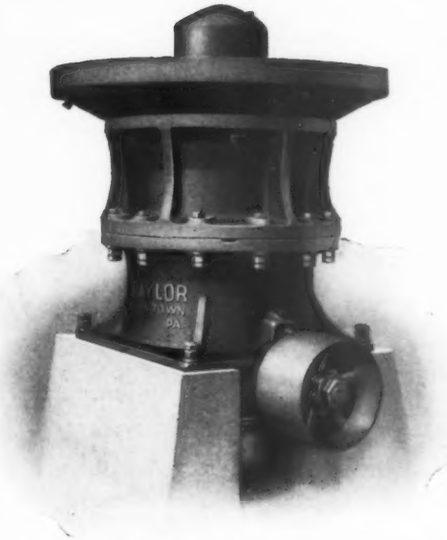

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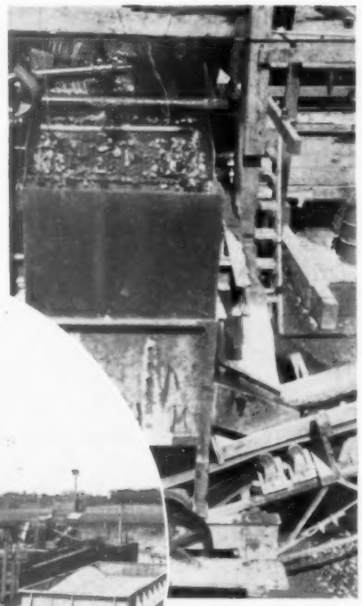

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A Directory of Pit and Quarry Advertisers Indexed According to Product.

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*Jeffrey Mfg. Co.
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*Austin-Western Road Machy. Co.
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*Williams Patent Crusher & Pulverizer Co.

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*Austin-Western Road Machy. Co.
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*Gruendler Crusher & Pulverizer Co.
*Jeffrey Mfg. Co.
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McLanahan and Stone Corp.
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Patterson Fdry. & Machine Co.
*Robins Conveying Belt Co.
*Williams Patent Crusher & Pulverizer Co.

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Pettibone-Mulliken Corp.

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Hummel-Foley Corp.

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*Link-Belt Co.
*Sauerman Bros., Inc.

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*Koehring Co.
*Link-Belt Co.
Northwest Engr. Co.

Draglines (Walking)
*Bucyrus-Monighan Co.

Dredge Engines
Clyde Iron Works, Inc.

Dredges
*Bucyrus-Erie Co.
Hetherington & Berner, Inc.
*Morris Machine Works

Drill Bit Reconditioning
Rock Bit Sales & Service, Inc.

Drilling Accessories
Independent Pneu. Tool Co.
Rock Bit Sales & Service, Inc.
Timken Roller Bearing Co.

Drilling Contractors
Hoffman Bros. Drilling Co.
Pennsylvania Drilling Co.

Drills (Blast-Hole)
Independent Pneu. Tool Co.

Drills (Core)
Hoffman Bros. Drilling Co.
Pennsylvania Drilling Co.

Drills (Diamond)
Hoffman Bros. Drilling Co
Pennsylvania Drilling Co.

Drills (Hand-Hammer)
Independent Pneu. Tool Co.

Drills (Rock)
*Jeffrey Mfg. Co.

Drill Steel
Independent Pneu. Tool Co.

Drills (Well) (See Drills—Blast-Hole)

Drives (Multiple, Belt, Chain, Rope)
*Allis-Chalmers Mfg. Co.

Dryers
*Allis-Chalmers Mfg. Co.
Bartlett & Snow Co., C. O.
*Hardinge Co.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Fdry. & Mch. Co.
McLanahan and Stone Corp.
Patterson Fdry. & Machine Co.
*Traylor Engr. & Mfg. Co.
*Tyler Co., W. S.

Dust Arresters
Bartlett & Snow Co., C. O.
*Blaw-Knox Co.
Dracco Corporation
*Parsons Engineering Corp.
*Western Precipitation Corp.

Dust Collecting Systems
Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
*Blaw-Knox Co.
Dracco Corporation
*Parsons Engineering Corp.
Patterson Fdry. & Machine Co.
*Raymond Pulverizer Div. of Combustion Engr. Co., Inc.
*Western Precipitation Corp.

Dust Conveying Systems
Allen-Sherman-Hoff Co.
Bartlett & Snow Co., C. O.
*Blaw-Knox Co.
Dracco Corporation
*Fuller Company
*Parsons Engineering Corp.
*Western Precipitation Corp

Dust Filters
*Parsons Engineering Corp.
*Western Precipitation Corp

Dust Handling Systems (Hydro Vacuum)
Allen-Sherman-Hoff Co.

Dynamite (See Explosives)

Electrical Equipment
*Allis-Chalmers Mfg. Co.
*Fairbanks, Morse & Co.
*General Electric Co.

Electrodes (Welding)
Stulz-Sickles Co.

Elevator Belting (See Belting)

Elevators (See Conveyors and Elevators)

Eliminators (Soft Stone) (See Soft Stone Eliminators)

Engineers
*Allis-Chalmers Mfg. Co.
Bacon, Inc., Earle C.
Bradley Pulverizer Co.
*Fuller Company
Hetherington & Berner, Inc.
Holmes & Bros., Inc., Robt.
Iowa Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
McLanahan and Stone Corp.
Patterson Fdry. & Machine Co.
*Robins Conveying Belt Co.
*Sprout, Waldron & Co.
Sturtevant Mill Co.
*Traylor Engr. & Mfg. Co.

Engine Generator Sets
See Generator Sets (Engine)

Engines (Diesel)
Caterpillar Tractor Co.
*Cooper-Bessemer Corp.
*Fairbanks, Morse & Co.
*Nordberg Mfg. Co.

Engines (Hoisting)
Clyde Iron Works, Inc.

Engines (Internal-Combustion)
Caterpillar Tractor Co.
*Cooper-Bessemer Corp.
*Fairbanks, Morse & Co.
*Nordberg Mfg. Co.

Engines (Steam)
*Morris Machine Works
*Nordberg Mfg. Co.

Excavating Machinery (See Shovels; Cranes; Buckets, etc.)

Excavators—Shallow Grading (Bucket Elevator Type)
Haiss Mfg. Co., Geo.

Fabricating (Electric Arc and Oxy-Acetylene)
Smith Co., S. Morgan
Stulz-Sickles Co.

Fans (Exhaust)
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.

Feeders
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Bartlett & Snow Co., C. O.
Bradley Pulverizer Co.
*Fuller Company
*Hardinge Co.
*Huron Industries Co.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Link-Belt Co.
Patterson Fdry. & Machine Co.
*Robins Conveying Belt Co.
Smith Engr. Works
*Sprout, Waldron & Co.
*Traylor Engr. & Mfg. Co.

Floor Sweeping Systems (Hydro Vacuum)
Allen-Sherman-Hoff Co.

Fuses (Detonating)
*Ensign-Bickford Co.

Fuses (Electrical)
*General Electric Co.

Gaskets
*Cincinnati Rubber Mfg. Co.
Goodyear Tire & Rubber Co.
Hewitt Rubber Corp.
Republic Rubber Co.

Gasoline Engines (See Engines—Internal-Combustion)

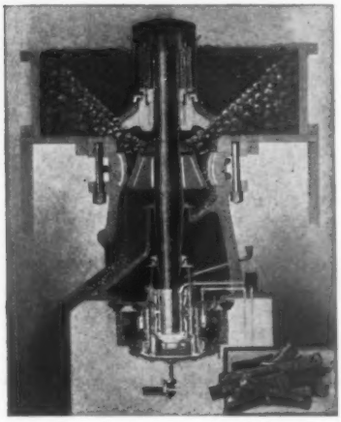
Gas Producers
Wellman Engr. Co.

Gates (Bin) (See Bin Gates)

Gates (Clamshell)
Haiss Mfg. Co., Geo.
*Link-Belt Co.

Gears (Herringbone)
Bartlett & Snow Co., C. O.
*General Electric Co.

*See also information in the 1937 Pit and Quarry HANDBOOK.



GREATER TONNAGE with HALF THE POWER COST Guaranteed

THE Kennedy Ball Bearing Gearless Gyratory Crusher is guaranteed to produce a greater tonnage than any other crusher of a given size, with half the power per ton of ore. This crusher can be equipped with a synchronous motor in its pulley, or driven by flat or V-belt from a standard motor.

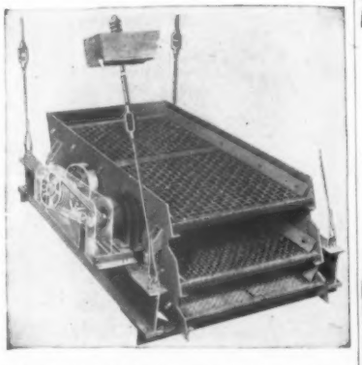
The Savings Effected with this crusher are astounding:

In cost of Maintenance 80%
In Power ..... The entire cost of crusher and motor in pulley is amortized annually.

Sieving test on glacial gravel crushed at the rate of 18 tons per hour, with No. 19 crusher set to ⅛ in., and using less than 25 hp., follows:

Minus ⅜ in.	100%
Plus 3 mesh	21½%
Minus 3—Plus 4	17%
Minus 4—Plus 14	36½%
Minus 14—Plus 48	15%
Minus 48—Plus 100	4%
Minus 100	5½%

KENNEDY VIBRATING SCREEN



Built in open or enclosed types, in widths ranging from 3′ to 6′ with one or more decks. It can be suspended, or supported from the bottom.
Suitable for scalping oversize from primary crushers, as well as smaller sizes, and chemical products.
The entire screening surface is effective, thereby insuring greatest capacity.
Equipped with self-aligning main bearings which account for low power consumption and also for long life of bearings.
Screen drive shaft is positioned near the feed end for balancing purposes and is patented.

Write for One of Our Engineers to Call

KENNEDY-VAN SAUN MFG. & ENG. CORP.
2 Park Avenue New York, N. Y.

Sales Agents in all Principal Cities of the United States.

2½ TONS A MINUTE with a 16" AMSCO "COUNTERFLOW" PUMP

TRADE MARK REGISTERED

5,000 lbs. is a lot of material to handle in one minute, but that is what a 16" AMSCO "COUNTERFLOW" Pump is doing — 150 tons an hour — hundreds of tons daily at the Guntersville, Ala., Dam, fourth major project of the T.V.A.

Aggregate for approximately 285,000 cubic yards of concrete is being handled by this AMSCO Material Handling Pump on the suction dredge *COLUMBUS* owned by the American Aggregates Corp. of Greenville, Ohio.

AMSCO "COUNTERFLOW" Pumps are built to meet any material pumping requirement and are made in all sizes from 3" to 20".

The "COUNTERFLOW" principle minimizes internal wear by introducing clear water under pressure between the impeller shrouds and the side plates, thus displacing the abrasive grit-laden water which would normally occupy this space.

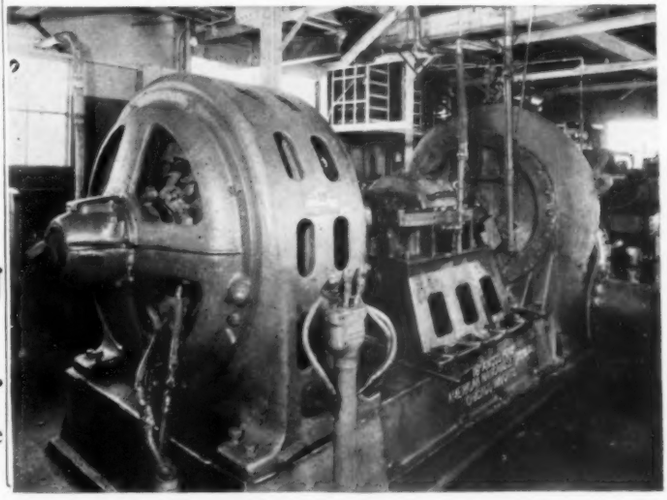
Made of Manganese Steel throughout the water end, AMSCO "COUNTERFLOW" Pumps insure utmost resistance to impact and abrasion. Wide funnel mouth impeller provides smooth flow of material. Threaded impeller bore allows for screwing onto shaft, eliminating difficulties encountered by set screws and keyways.

AMSCO Manganese Steel Flap Valves, Pipe Fittings and Cutter Heads are worthy companions to AMSCO Pumps.

Send for bulletin detailing the complete AMSCO Line of Manganese Steel Abrasive Materials Pumping Units.

AMERICAN MANGANESE STEEL DIVISION
of The American Brake Shoe & Foundry Company
396 E. 14th Street, Chicago Heights, Ill.

Foundries at Chicago Heights, Ill.; New Castle, Del.; Denver, Colo.; Oakland, Calif.; Los Angeles, Calif.; St. Louis, Mo.
Offices in Principal Cities



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*Link-Belt Co.
*Sprout, Waldron & Co.

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*General Electric Co.
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*Link-Belt Co.
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*Sprout, Waldron & Co.

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Generators (See Motors and Generators)

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Generator Sets (Motor)
*General Electric Co.

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*General Electric Co.

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*Huron Industries Co.
Iowa Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Fdy. & Mach. Co.
Pettibone-Mulliken Corp.
*Robins Conveying Belt Co.
Smith Engr. Works

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Bartlett & Snow Co., C. O.
National Wire Cloth Co.

Guns (Hydraulic)
Hetherington & Berner, Inc.
Taylor Forge & Pipe Works

Hammer Mills (See Crushers—Hammer)

Haulage Systems (Electric)
*General Electric Co.

Heat Treating Furnaces
Leeds & Northrup Co.

Heaters (Bitumen)
Easton Car and Const. Co.

Hoists
Bartlett & Snow Co., C. O.
Clyde Iron Works, Inc.
Hetherington & Berner, Inc.
Iowa Mfg. Co.
*Jaeger Machine Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
McLanahan and Stone Corp.
*Sauerman Bros., Inc.
Smith Engr. Works
*Sprout, Waldron & Co.

Hoppers
*Chicago Bridge and Iron Co.
*Hendrick Mfg. Co.
*Link-Belt Co.

Hose (Air, Steam and Water)
*Cincinnati Rubber Mfg. Co.
Goodyear Tire & Rubber Co.
Hewitt Rubber Corp.
Independent Pneu. Tool Co.
Republic Rubber Co.

Hose (Radiator-Engine Cooling)
Goodyear Tire & Rubber Co.
Republic Rubber Co.

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Idlers
American Manganese Steel Co.
Bartlett & Snow Co., C. O.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.
Smith Engr. Works
*Sprout, Waldron & Co.

Kilns and Coolers (Rotary)
*Allis-Chalmers Mfg. Co.
Bartlett & Snow Co., C. O.
*Chicago Bridge and Iron Co.
*Hardinge Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Patterson Fdry. & Machine Co.
*Traylor Engr. & Mfg. Co.

Kilns (Vertical)
*Chicago Bridge and Iron Co.
*Hardinge Co.

Lights (Flood)
*General Electric Co.

Lime-Handling Equipment
Bartlett & Snow Co., C. O.
*Chicago Bridge and Iron Co.
*Fuller Company
*Hardinge Co.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Raymond Pulverizer Div. of Combustion Engr. Co., Inc.
*Robins Conveying Belt Co.

Lime and Hydrating Plants
*Chicago Bridge and Iron Co.
*Hardinge Co.
Traylor Engr. & Mfg. Co.

Lime Kilns
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*Chicago Bridge and Iron Co.
*Hardinge Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.

Lime Putty Plants
*Chicago Bridge and Iron Co.

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Hummel-Foley Corp.

Linings (Ball- and Tube-Mill) (See Mill Liners and Linings)

Loaders and Unloaders
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*Bucyrus-Erie Co.
*Fuller Company
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*Jeffrey Mfg. Co.
*Link-Belt Co.
Patterson Fdry. & Machine Co.
*Robins Conveying Belt Co.
*Sprout, Waldron & Co.

Locomotives (Diesel)
*Whitcomb Locomotive Co.

Locomotives (Diesel-Electric)
*General Electric Co.
*Whitcomb Locomotive Co.

Locomotives (Electric, Gas, Steam)
*General Electric Co.
*Whitcomb Locomotive Co.

Locomotives (Gas-Electric)
*General Electric Co.
*Whitcomb Locomotive Co.

Locomotives (Oil-Electric)
*General Electric Co.
*Whitcomb Locomotive Co.

Locomotives (Storage Battery)
*General Electric Co.
*Jeffrey Mfg. Co.

Locomotives (Trolley-Battery)
*General Electric Co.
*Jeffrey Mfg. Co.

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*The Gredag Corp.

Magnetic Pulleys (See Pulleys, Magnetic)

Manganese Steel
American Manganese Steel Co.
Pettibone-Mulliken Corp.

Manganese Steel Castings
American Manganese Steel Co.
Pettibone-Mulliken Corp.

Manganese Steel (Plates and Sheets)
American Manganese Steel Co.

Measuring Devices (Electric)
*General Electric Co.

Measuring Instruments
Leeds & Northrup Co.

Mechanical Rubber Goods
*Cincinnati Rubber Mfg. Co.
Goodyear Tire & Rubber Co.
Hewitt Rubber Corp.
Republic Rubber Co.

Mill Liners and Linings
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Bartlett & Snow Co., C. O.
Carnegie-Illinois Steel Corp.
*Hardinge Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Patterson Fdry. & Machine Co.
*Traylor Engr. & Mfg. Co.

Mills (Ball, Tube, etc.)
*Allis-Chalmers Mfg. Co.
*Hardinge Co.
Patterson Fdry. & Machine Co.
*Traylor Engr. & Mfg. Co.

Mills (Grinding) (See also Crushers—Hammer)
*Allis-Chalmers Mfg. Co.
*American Pulverizer Co.
Bartlett & Snow Co., C. O.
Bradley Pulverizer Co.
*Hardinge Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Fdy. & Mch. Co.
Patterson Fdry. & Machine Co.
*Raymond Pulverizer Div. of Combustion Engr. Co., Inc.
*Sprout, Waldron & Co.
*Traylor Engr. & Mfg. Co.
*Williams Patent Crusher & Pulverizer Co.

Motors and Generators
*Allis-Chalmers Mfg. Co.
*Fairbanks, Morse & Co.
*General Electric Co.
*Harnischfeger Corp.

Motors (Internal-Combustion) (See Engines — Internal-Combustion)

Nails
*American Steel & Wire Co.

Netting (Locomotive Stack)
*Tyler Co., W. S.

Nozzles (Gravel Washing)
*Deister Concentrator Co.

Nozzles (Hydraulic) (See Guns—Hydraulic)

Nozzles (Spray)
*Deister Concentrator Co.

Oils
*The Gredag Corp.

Packings
*Cincinnati Rubber Mfg. Co.
Goodyear Tire & Rubber Co.
Hewitt Rubber Corp.
Republic Rubber Co.

Partitions (Wire)
National Wire Cloth Co.

Paving Mixers
*Jaeger Machine Co.
*Koehring Co.

Perforated Metal Plates
*Allis-Chalmers Mfg. Co.
Bartlett & Snow Co., C. O.
Chicago Perforating Co.
*Hendrick Mfg. Co.
*Sprout, Waldron & Co.
*Wickwire Spencer Steel Co.

Pipe, Dredge (Floating and Shore)
*Chicago Bridge and Iron Co.
Naylor Pipe Co.
Taylor Forge & Pipe Works

Pipe Flanges
Hetherington & Berner, Inc.
Naylor Pipe Co.
Taylor Forge & Pipe Works

Pipe Forms (Concrete)
Quinn Wire & Iron Works
Universal Concrete Pipe Co.

Pipe Machines (Concrete)
Quinn Wire & Iron Works
Universal Concrete Pipe Co.

Pipe (Spiral)
Naylor Pipe Co.
Taylor Forge & Pipe Co.

Pipe (Welded)
Naylor Pipe Co.
Taylor Forge & Pipe Co.

Plants (Aggremeter) (See Aggremeter Plants)

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Portable Conveyors
*Fuller Company
Haiss Mfg. Co., Geo.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.

Portable Crushing and Screening Plants
*Austin-Western Road Machy. Co.
Bartlett & Snow Co., C. O.
*Gruendler Crusher & Pulverizer Co.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Williams Patent Crusher & Pulverizer Co.

Portable Engines (See Engines—Internal Combustion)

Portable Loaders (See Loaders and Unloaders)

Power Cables (Rubber Clad)
*American Steel & Wire Co.

Power Shovels (See Shovels, Electric, Internal-Combustion and Steam)

Precipitators
*Western Precipitation Corp.

Pre-formed Wire Rope
*American Cable Division of the American Chain & Cable Co.
Broderick & Bascom Rope Co.
*Leschen & Sons Rope Co., A.
Williamsport Wire Rope Co.

Proportioning Equipment
*Blaw-Knox Co.
*Jaeger Machine Co.

Pulleys
*Huron Industries Co.
Sprout, Waldron & Co.

Pulleys (Magnetic)
*Sprout, Waldron & Co.

Pulleys (Wing)
*Sprout, Waldron & Co.

Pulverized Fuel Systems
Bartlett & Snow Co., C. O.
*Hardinge Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Raymond Pulverizer Div. of Combustion Engr. Co., Inc.

Pulverizers (See also Crushers, Mills, etc.)
*American Pulverizer Co.
*Austin-Western Road Machy. Co.
Bartlett & Snow Co., C. O.
Bradley Pulverizer Co.
*Gruendler Crusher & Pulverizer Co.
*Hardinge Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machine Co.
New Holland Machine Co.
Patterson Fdry. & Machine Co.
*Raymond Pulverizer Div. of Combustion Engr. Co., Inc.
Sturtevant Mill Co.
Traylor Engr. & Mfg. Co.
*Williams Patent Crusher & Pulverizer Co.

Pump Parts
Pettibone-Mulliken Corp.

Pump Valves (See Valves, Pump)

Pumps (Air-Lift)
*Fuller Company
*Ingersoll-Rand Co.

Pumps (Bulk Cement)
*Fuller Company

Pumps (Cement Slurry)
Allen-Sherman-Hoff Co.
*Morris Machine Works

Pumps (Centrifugal)
Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Erie Pump & Engine Works
*Fairbanks, Morse & Co.
Hetherington & Berner, Inc.
Independent Pneu. Tool Co.
*Jaeger Machine Co.
Kansas City Hay Press Co.
*Morris Machine Works
Pettibone-Mulliken Corp.

Pumps (Dredging)
Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
*Bucyrus-Erie Co.
Erie Pump & Engine Works
*Fairbanks, Morse & Co.
Hetherington & Berner, Inc.
Kansas City Hay Press Co.
*Morris Machine Works
Pettibone-Mulliken Corp.

Pumps (Sand and Gravel)
Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.

* See also information in the 1937 Pit and Quarry HANDBOOK.

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Costs Less with Williams Roller Mills

More Efficient Separator
Instantly changeable from 70%—100 mesh to 99.9%—325 mesh

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PATENT CRUSHERS GRINDERS SHREDDERS

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Air Separators
Vibrating Screens
Impact Mills

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SCREEN NOZZLE LADDER

Eliminates costly delays and irregular production due to suction line becoming clogged with boulders or debris from the deposit. Speed up production and incidentally *boost your profits* with the EAGLE "SWINTEK" NOZZLE LADDER. It insures an even flow of solids by loosening and agitating the deposit with a screen chain which also carries away everything that might otherwise clog the nozzle.

The EAGLE "SWINTEK" NOZZLE LADDER means CONTINUOUS OPERATION — GREATER OUTPUT — MORE PROFIT! Full information on request.

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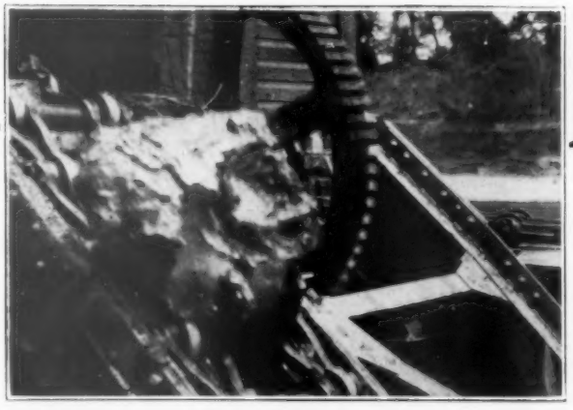

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BUYERS' GUIDE

A Directory of Pit and Quarry Advertisers Indexed According to Product.

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*Link-Belt Co.

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*Jeffrey Mfg. Co.
*Link-Belt Co.
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Patterson Fdry. & Machine Co.
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Smith Engr. Works

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Iowa Mfg. Co.
*Jeffrey Mfg. Co.
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*Nordberg Mfg. Co.
Patterson Fdry. & Machine Co.
Smith Engr. Works

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Scales (Track or Truck)
*Fairbanks, Morse & Co.

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*Austin-Western Road Machy. Co.
Continental Roll & Steel Fdry. Company
Iowa Mfg. Co.
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*Sauerman Bros., Inc.

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Continental Roll & Steel Fdry. Company

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American Manganese Steel Co.
Bacon, Inc., Earle C.
Bartlett & Snow Co., C. O.
Carnegie-Illinois Steel Corp.
Chicago Perforating Co.
Cleveland Wire Cloth & Mfg. Co.
*Deister Concentrator Co.
*Deister Machine Co.
*Eagle Iron Works
*Gruendler Crusher & Pulverizer Co.
Haiss Mfg. Co., Geo.
*Hardinge Co.
*Hendrick Mfg. Co.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machine Co.
*Link-Belt Co.
Ludlow-Saylor Wire Co.
McLanahan and Stone Corp.
National Wire Cloth Co.
*Nordberg Mfg. Co.
*Robins Conveying Belt Co.
Simplicity Engr. Co.
Smith Engr. Works
*Sprout, Waldron & Co.
Sturtevant Mill Co.
*Traylor Engr. & Mfg. Co.
*Tyler Co., W. S.
*Wickwire Spencer Steel Co.

Screens (Vibrating or Shaking)
*Allis-Chalmers Mfg. Co.
*Austin-Western Road Machy. Co.
Bartlett & Snow Co., C. O.
*Deister Concentrator Co.
*Deister Machine Co.
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*Huron Industries Co.
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*Tyler Co., W. S.
*Williams Patent Crusher & Pulverizer Co.

Scrubbers
*Traylor Engr. & Mfg. Co.
*Tyler Co., W. S.

Seal Rings
*Huron Industries Co.

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Separators (Magnetic)
Exolon Co.
Patterson Fdry. & Machine Co.

Sheaves
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American Manganese Steel Co.
*Eagle Iron Works
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Hetherington & Berner, Inc.
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*Jeffrey Mfg. Co.
McLanahan and Stone Corp.
Pettibone-Mulliken Corp.
*Sprout, Waldron & Co.

Shovels (Electric, Internal-Combustion and Steam)
*Austin-Western Road Machy. Co.
*Bay City Shovels, Inc.
*Bucyrus-Erie Co.
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*Cincinnati Rubber Mfg. Co.

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*General Electric Co.
*Huron Industries Co.
Iowa Mfg. Co.
*Link-Belt Co.

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Holmes & Bros., Inc., Robt.

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Sprays
*Deister Concentrator Co.

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American Manganese Steel Co.
Bartlett & Snow Co., C. O.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
Pettibone-Mulliken Corp.
*Sprout, Waldron & Co.

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*Jeffrey Mfg. Co.

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*General Electric Co.

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(See Alloys—Steel)

Steel Grating (See Grating, Steel)

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*Chicago Bridge and Iron Co.
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Holmes & Bros., Inc., Robt.
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Stone Grapples
Owen Bucket Co.

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Bartlett & Snow Co., C. O.
*Chicago Bridge and Iron Co.
Haiss Mfg. Co., Geo.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Sauerman Bros., Inc.

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*General Electric Co.

Switches (Electric)
*General Electric Co.

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Bartlett & Snow Co., C. O.
*Chicago Bridge and Iron Co.
*Hendrick Mfg. Co.
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Tanks (Elevated Steel)
*Chicago Bridge and Iron Co.

Tanks (Sand-Settling)
Bartlett & Snow Co., C. O.
*Chicago Bridge and Iron Co.
Iowa Mfg. Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
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Smith Engr. Works

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*Hendrick Mfg. Co.
*Tyler Co., N. S.

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*Hardinge Co.
Patterson Fdry. & Machine Co.

Tire Repair Materials
Goodyear Tire & Rubber Co.

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Track Equipment
Pettibone-Mulliken Corp.

Track Shifters
*Nordberg Mfg. Co.

Tractors
*Allis-Chalmers Mfg. Co.
Caterpillar Tractor Co.

Trailers (Industrial
Easton Car and Const. Co.

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*American Steel & Wire Co.

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Transmission Belting (See Belting)

Transmission Machinery
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*Gruendler Crusher & Pulverizer Co.
*Jeffrey Mfg. Co.
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Bartlett & Snow Co., C. O.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.

Truck Cranes (See Cranes)

Truck Mixers
Bartlett & Snow Co., C. O.
*Blaw-Knox Co.
*Jaeger Machine Co.

Trucks and Trailers (See Motor Trucks)

Tube-Mills (See Mills—Ball, Tube, etc.)

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*Fuller Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.

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*Cincinnati Rubber Mfg. Co.
Taylor Forge & Pipe Works

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Bartlett & Snow Co., C. O.
Chicago Perforating Co.
*Hendrick Mfg. Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.

Vibrating Screens (See Screens—Vibrating)

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Independent Pneu. Tool Co.
*Jeffrey Mfg. Co.
*Tyler Co., W. S.

Wagons (Dump)
*Austin-Western Road Machy. Co.
Easton Car and Const. Co.
*Koehring Co.

Wagon Scrapers
Continental Roll & Steel Fdry. Co.

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*Allis-Chalmers Mfg. Co.
*Austin-Western Road Machy. Co.
Bartlett & Snow Co., C. O.
*Eagle Iron Works
Haiss Mfg. Co., Geo.
*Hardinge Co.
Iowa Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Mach. Co.
*Link-Belt Co.
McLanahan and Stone Corp.
Patterson Fdry. & Machine Co.
Smith Engr. Works
*Traylor Engr. & Mfg. Co.
*Tyler Co., W. S.

Weighing Equipment (Automatic)
*Blaw-Knox Co.
*Fuller Co.
*Jaeger Machine Co.

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Stulz-Sickles Co.

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Smith Company, S. Morgan
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Bradley Pulverizer Co.
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American Manganese Steel Co.
*American Steel & Wire Co.
*General Electric Co.
*Harnischfeger Corp.
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Well Drills (See Drills—Well)

*See also information in the 1937 Pit and Quarry HANDBOOK.

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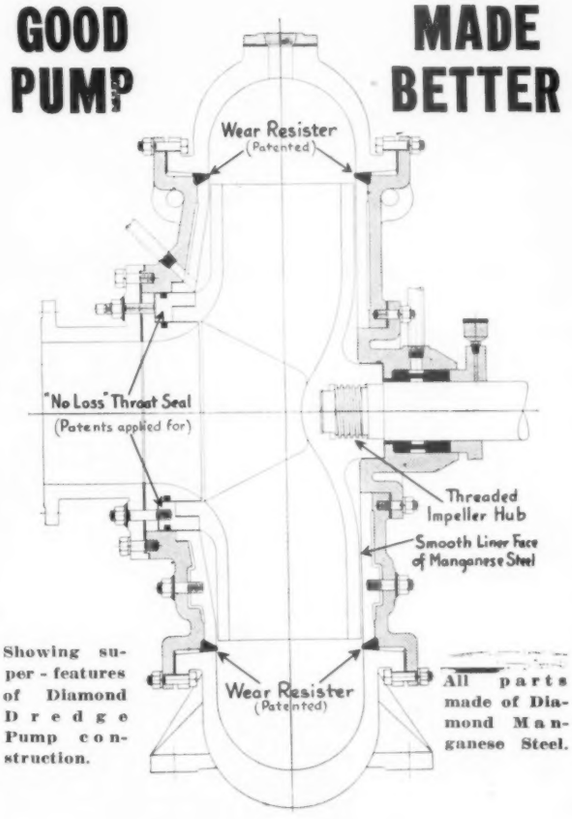

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now give their users even better performance because of newly developed features. Operators can now produce material at a still lower cost. The patented "Wear Resister" protects pump shell, side plates and liners from wear at vital points. Threaded Impeller Hub or Bore gives greater impeller throat clearance and insures a true running impeller at all times. "No Loss" Throat Seal prevents internal leakage. P.M. Co. Products include Traveling Chain Cutter, Rotary Cutters, Elbows, Flap Valves, Nipples, Jaw Plates, Crusher Parts, Dippers, Dipper Teeth, Sheaves, and other Manganese Steel Products.

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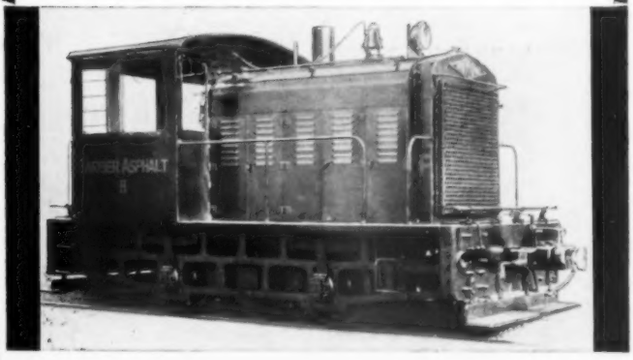

BUYERS' GUIDE

A Directory of Pit and Quarry Advertisers Indexed According to Product.

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Wheels (Car)
American Manganese Steel Co.
*Eagle Iron Works
Iowa Mfg. Co.
Pettibone -Mulliken Corp.

Wheel Rims. See Rims—Wheel

Winches and Capstans
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.
*Sprout, Waldron & Co.

Wire and Cable (Electric)
*American Steel & Wire Co.
*General Electric Co.

Wire Cloth
Cleveland Wire Cloth & Mfg Co.
Ludlow-Saylor Wire Co.
National Wire Cloth Co.
*Robins Conveying Belt Co.
Tyler Co., W. S
*Wickwire Spencer Steel Co.

Wire Rope
*American Cable Division of the American Chain & Cable Co.
*American Steel & Wire Co.
Broderick & Bascom Rope Co.
*Leschen & Sons Rope Co., A.
*Wickwire Spencer Steel Co.

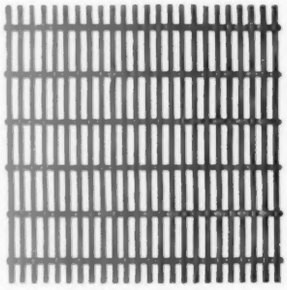
Wire Rope Fittings
*American Steel & Wire Co.
*American Cable Division of the American Chain & Cable Co.
Broderick & Bascom Rope Co.
*Leschen & Sons Wire Rope Co., A.
*Wickwire Spencer Steel Co.

Wire Rope Slings
*American Cable Division of the American Chain & Cable Co.
*American Steel & Wire Co.
Broderick & Bascom Rope Co.
*Leschen & Sons Rope Co., A.
*Wickwire Spencer Steel Co.

Wire (Welding)
American Manganese Steel Co.
*American Steel & Wire Co.
*Wickwire Spencer Steel Co.

Worm Gears (See Gears and Pinions)

* See also information in the 1937 Pit and Quarry HANDBOOK.



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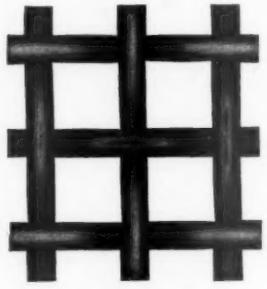
A wire cloth of guaranteed accuracy backed by fine workmanship and an effort to satisfy.

Available in Square Mesh and Rolled Slot. A trial will convince you of the superiority.



2 Mesh .162 Ga.

THE CLEVELAND WIRE CLOTH & MFG. COMPANY
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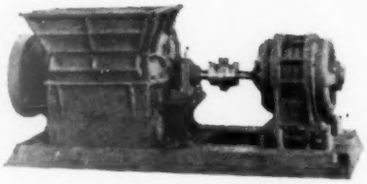

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Built in a full range of types and sizes for today's requirements: — High efficiency crushing — Low power consumption — Uniform cubical products.

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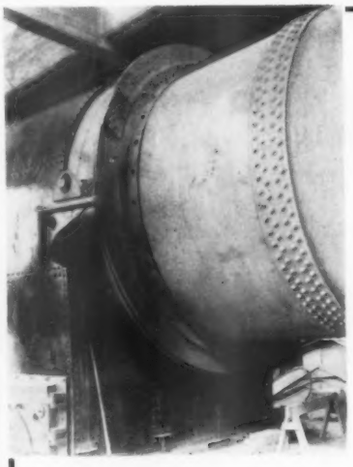

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Increased from 7 to 12% with

HURON SEAL RINGS

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Savings in fuel, elimination of dust losses and better temperature control increase the efficiency of the kiln 7 to 12 per cent. Savings also are effected in labor and maintenance.

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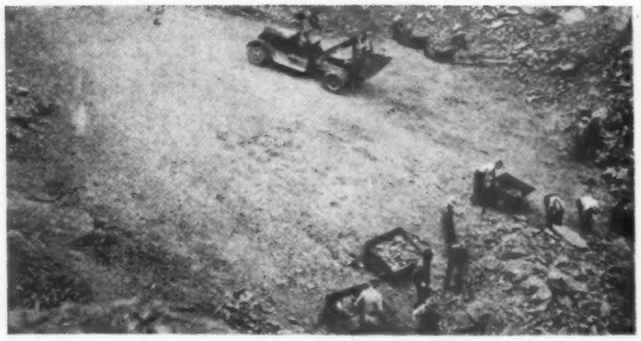

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They increase profits by decreasing loading, hauling and dumping time.

Detachable buckets are spotted at points of loading and filled while previously filled buckets are being hauled to destination.

Loaded buckets are picked up after empty buckets are respotted. It is all very simple.

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No heavy costly equipment to eat into profits—no delay — no high upkeep cost—no disappointments.

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It's the modern, easy, speedy, economical and efficient way of hauling material more profitably. Low initial investment.

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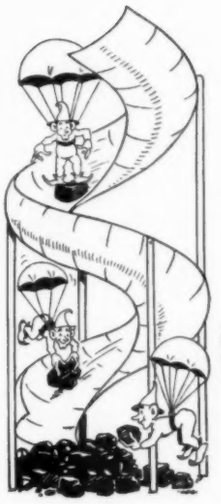

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NO DEGRADATION

NO BREAKAGE

Handle your sized material with Holmes Lowering Spirals. The gentle sliding descent of materials prevents breakage or degradation—saves you money and eliminates wastage. Operated by gravity these lowering spirals have no power cost.

Tailored to your particular requirements, Holmes Lowering Spirals will give the utmost in efficiency and economy. Let our engineers consult with you.

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. . . for Efficient Screening Over Entire Area

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Designed and built to be easy on itself — to avoid unnecessary wear—the Link-Belt Vibrating Screen lasts a long time with few repairs. Low in first cost —low in maintenance—an economical screen to operate. Send for 24-page illustrated catalog, complete with clearance diagrams and dimension tables on the two distinct types of Link-Belt vibrating screens ("UP" and "PD").

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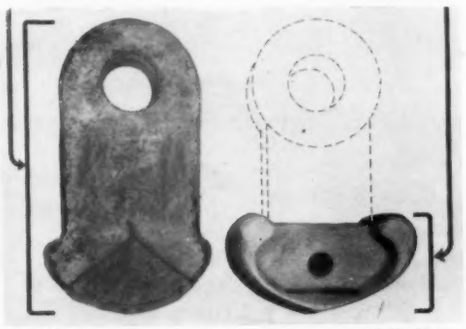

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These hammers have been used by several leading cement mills on the Pacific Coast for several years with complete success. Write today.

Patented

ELECTRIC STEEL FOUNDRY CO.

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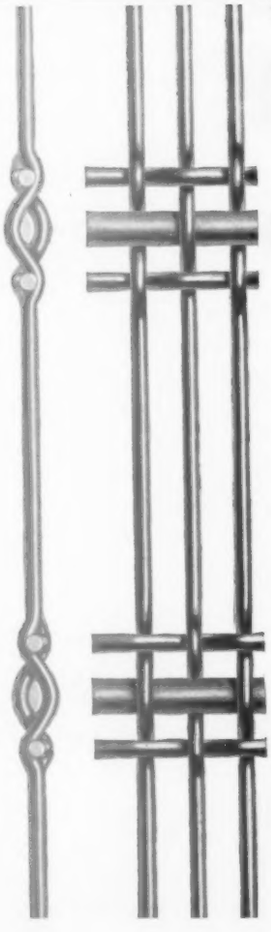

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Long-Mesh Woven Wire Screens

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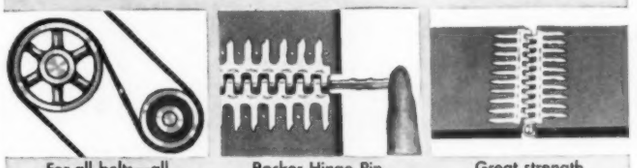
The compression grip protects belt ends. | Made with precision. Drives straight. | Smooth on both faces. Embeds in belt.



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- ☐ Bin gates
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- ☐ Bins, steel
- ☐ Blasting supplies
- ☐ Blasting powder
- ☐ Blocks, friction
- ☐ Boats, self-unloading
- ☐ Bodies, Motor Trucks
- ☐ Brake Linings
- ☐ Buckets, Clamshell
- ☐ Buckets, Conveyor and Elevator
- ☐ Buckets, Dragline
- ☐ Buckets, Orange Peel
- ☐ Cableways, Slackline
- ☐ Calcining Machinery
- ☐ Car Dumpers
- ☐ Car Pullers and Movers
- ☐ Carriers, Belt
- ☐ Cars, Dump
- ☐ Cars, Kiln
- ☐ Castings, Manganese Steel
- ☐ Castings, Steel
- ☐ Chains, Conveyor and Elevator
- ☐ Chains, Power Shovel, Crane and Dredge
- ☐ Chains, Transmission
- ☐ Chutes
- ☐ Classifiers
- ☐ Clips, Wire Rope
- ☐ Clutches
- ☐ Clutches, Magnetic
- ☐ Concrete Plants, Ready Mixed
- ☐ Cones, Washing
- ☐ Conveyors, Apron
- ☐ Conveyors, Belt
- ☐ Conveyors, Pneumatic
- ☐ Conveyors, Screw
- ☐ Conveyors, Skip
- ☐ Coolers
- ☐ Couplings, Flexible
- ☐ Couplings, Hose
- ☐ Cranes, Locomotive
- ☐ Cranes, Overhead Traveling
- ☐ Cranes, Truck
- ☐ Crushers, Cone
- ☐ Crushers, Disc
- ☐ Crushers, Gyratory
- ☐ Crushers, Hammer
- ☐ Crushers, Jaw
- ☐ Crushers, Ring
- ☐ Crushers, Roll
- ☐ Crushers, Rotary
- ☐ Cutter Heads, Dredging
- ☐ Derricks
- ☐ Draglines, Cableway
- ☐ Draglines, Revolving Boom
- ☐ Dredges, Dipper
- ☐ Dredges, Hydraulic
- ☐ Dredges, Ladder
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- ☐ Drills, Diamond Core
- ☐ Drills, Hand Hammer
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- ☐ Dryers, Sand and Gravel
- ☐ Dust Collecting Systems
- ☐ Dynamite
- ☐ Elevators, Bucket
- ☐ Engines, Diesel
- ☐ Engines, Gas
- ☐ Engines, Gasoline
- ☐ Engines, Hoisting
- ☐ Engines, Oil
- ☐ Feeders
- ☐ Filters, Air
- ☐ Filters, Oil
- ☐ Fire Brick
- ☐ Flanges, Pipe
- ☐ Frogs and Switches
- ☐ Fuses, Blasting
- ☐ Gears
- ☐ Goggles
- ☐ Governors
- ☐ Grinding Balls
- ☐ Grizzlies
- ☐ Guns, Hydraulic
- ☐ Hoists, Air
- ☐ Hoists, Derrick
- ☐ Hoists, Drum
- ☐ Hoists, Motor Truck Body
- ☐ Hoists, Skip
- ☐ Hose, Air, Stream, Water
- ☐ Hose, Sand Suction
- ☐ Hydrators
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- ☐ Kilns, Rotary
- ☐ Kilns, Vertical
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- ☐ Loaders and Unloaders Box Car
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- ☐ Locomotives, Steam
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- ☐ Lubricants
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- ☐ Mills, Tube
- ☐ Mixers, Plaster
- ☐ Motors, Electric
- ☐ Motors, Gasoline
- ☐ Motor Trucks
- ☐ Motor Trucks, Ready-Mixed Concrete
- ☐ Nozzles, Hydraulic Mining
- ☐ Nozzles, Gravel Washing
- ☐ Nozzles, Spray
- ☐ Nozzles, Dust Settling
- ☐ Nozzles, Suction Hose
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- ☐ Pulverizers, Rod
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- ☐ Pumps, Centrifugal
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- ☐ Pumps, Sand and Gravel
- ☐ Pumps, Slurry
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- ☐ Skips
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- ☐ Slugs and Nuggets, Grinding
- ☐ Speed Reducers and Gears
- ☐ Spray Nozzles
- ☐ Sprays, Paint
- ☐ Sprockets
- ☐ Steel, Tool
- ☐ Stokers
- ☐ Switches, Track
- ☐ Tanks, Concrete and Stee
- ☐ Tanks, Sand Settling
- ☐ Tanks, Wood
- ☐ Thickeners, Slurry
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- ☐ Track Shifters
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- ☐ Trippers, Belt
- ☐ Trippers, Tramway
- ☐ Unloaders
- ☐ Valves, Pump
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- ☐ Weighers, Automatic
- ☐ Welding Supplies
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- ☐ Winches
- ☐ Wire Cloth
- ☐ Wire Cloth, Manganese Steel

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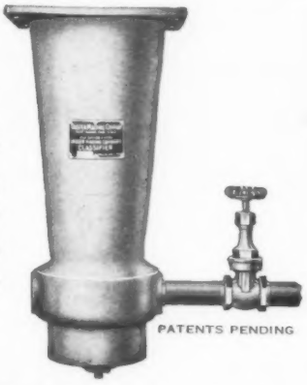
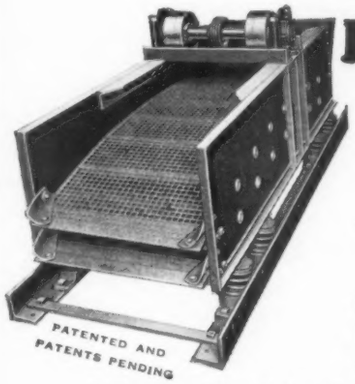
Address ..... *City* ..... *State* .....

COMPOUND FUNNEL CLASSIFIER

For sizing minus 5/16" gravel and sand, and for cleaning it by washing out silt and other light impurities.

Descriptive Bulletin No. 23





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Improved Heavy Duty

VIBRATING SCREEN

Built in all standard sizes—in from one to three decks.

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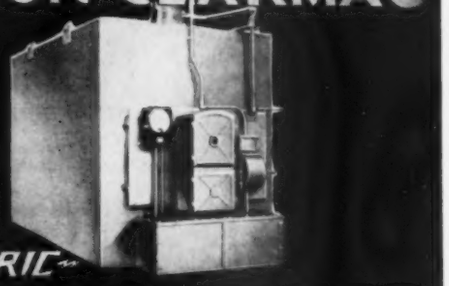

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of asphalt heating costs with this machine. Uses cheap electricity at night. Automatic control economizes current. Requires but slight attention — just throw a switch and change a record card. Delivers asphalt at correct temperature no matter how irregular the demand. Greatly improves quality, speed and durability of jobs. Eliminates coal piles, ash handling, boiler investment, maintenance of piping and jacketing, inspections, insurance, fire hazard. Adds much to profit. 100 installations prove success. Write for full details.

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WELDING *of Large Pieces* by SMITH

PUT your big welding jobs up to us. Investigate our facilities and extensive experience. Profit by the advantages Smith's Welding Service provides!

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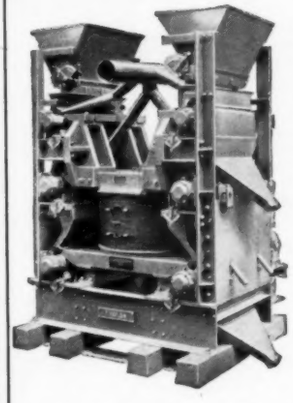
IMPOSSIBLE

to Separate?



The Exolon Type C Double 30 Magnetic Separator

Don't be too sure, at least until you've given the Exolon Separator a chance at it, for this remarkable machine has a habit of solving "impossible" separation problems. Dependably, economically, uniformly, almost automatically, the Exolon High Intensity Magnetic Separator is daily handling a wide variety of complex mineral combinations to the complete satisfaction of its users. Many materials, which in the past have resisted magnetic separation, have been found to lend themselves to super-induction by the Exolon process, and as a result are now being concentrated and purified with greater efficiency and economy than ever before. Perhaps your product falls in this class; a test in our laboratory will tell. Write for details.

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Magnetic Separator

THE EXOLON COMPANY BLASDELL, N. Y.

Protect Shipments by

WRAPPED CARLOADS!

It is a quick, easy job for one man to line a standard freight car with the new "tailored to fit" H-F Car Liner. One solid piece lines all sides and fits snugly into a single, tray-shaped bottom piece, where the weight of loading seals the joint.

Any granular or pulverized load is completely protected from contamination, rain damage, loss by seepage or sifting.

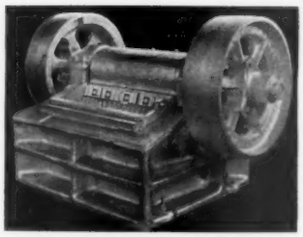
Write for prices and test offer.

HUMMEL-FOLEY CORPORATION
Hopewell, Virginia

H-F (One Man) CAR LINER

"CEDAR RAPIDS" ROLLER BEARING CRUSHER

Saves 90% On Lubrication Costs



Positive new seal keeps dirt out and grease in. Relubrication required only **once** in six months. SKF spherical self-aligning roller bearings reduce maintenance costs. Increases bearing life and eliminates failures due to overload. Main castings are electric cast annealed steel. Dependable. Durable. Economical. Many sizes. Write for bulletin.

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Cedar Rapids, Iowa

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LONG RANGE MACHINES

SLACKLINES and DRAG SCRAPERS

Simple, Durable, Economical Equipment for:

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Any capacity up to 1,000 tons per hour.

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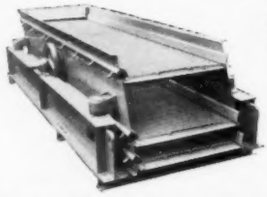
CIRCLE-THROW MECHANICALLY AND ELECTRICALLY-VIBRATED

SCREENS

TON-CAP



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In all Meshes and Metals

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Performance-Tested

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CRUSHERS **DRY PANS**

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Lewistown, Pa.

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Heavy-Duty (Ball-Bearing) Sand and Gravel

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High efficiency — low operating cost—precision workmanship — wear-resisting, non-heating bearings even when operated under extremely high heads. WRITE

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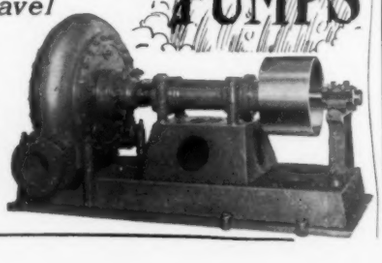
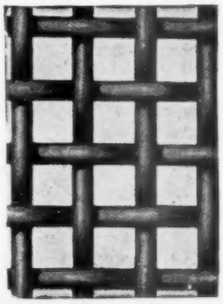


FIVE STAR FEATURES

of Nat-aloy Wire Cloth



- ★ Wears five to ten times as long as cloth made of ordinary steel
- ★ Withstands vibration without crystallization
- ★ Super-tough to resist abrasion
- ★ Maintains accuracy throughout life of screen
- ★ Economical in price and serviceability

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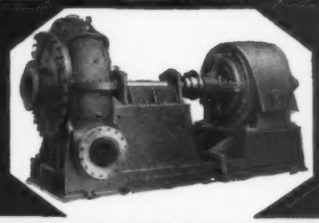
CENTRIFUGAL PUMPS



For handling sand, gravel, slurry, or clear water. Special designs and materials for each service. Also Hydraulic Dredges for sand and gravel production, deepening or enlarging lakes, reservoirs, waterways, etc.

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Baldwinsville, N. Y.

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HEAVY DUTY
DRYERS
Rotary Type

SINGLE UNITS OR COMPLETE WITH ACCESSORY BINS, CHUTES, FEEDERS, CONVEYORS, ELEVATORS, SCREENS, CRUSHERS AND OTHER EQUIPMENT AS DESIRED

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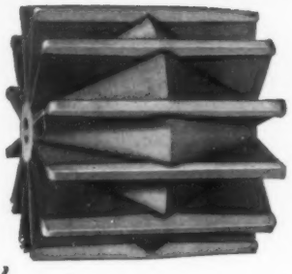
The C. O. BARTLETT & SNOW *Co.*
6197 Harvard Avenue · · Cleveland, Ohio



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where SPROUT-WALDRON Wing Pulleys are used. The same is true of your Elevator belts.

Material conveyed cannot lodge between belt and pulley to cut your belts.

Interchangeable with standard pulleys.

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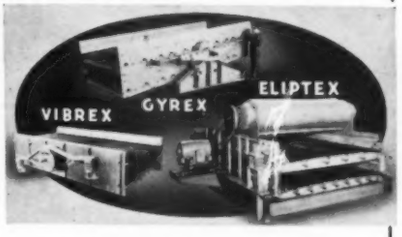
Elevating, Conveying and Transmission Equipment

THREE SCREENS
EACH..BEST FOR A SPECIAL PURPOSE

GYREX is for coarse screening and scalping, VIBREX for fine screening and ELIPTEX for fine and coarse screening horizontally. They come in over 300 sizes, styles and models. You can get what suits your service . . . from Robins.



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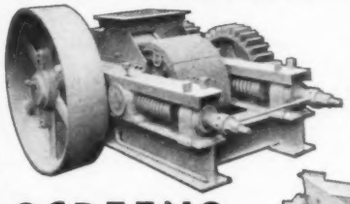

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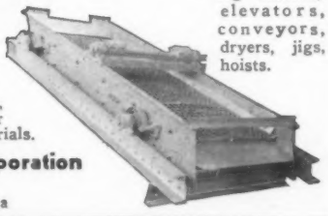
Single and double roll and jaw crushers, hammer mills, super dry pans, — steel log washers and scrubbers, sand drags, revolving and vibrating screens, elevators, conveyors, dryers, jigs, hoists.



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Complete portable, semi-portable and stationary crushing, screening and washing plants for different capacities of any materials.

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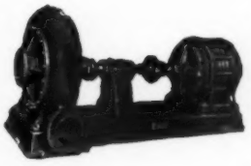
ERIE SAND PUMPS

EFFICIENCY ECONOMY



Their record of 48 years of satisfaction under the hardest conditions of pumping service outweighs all arguments. You can rely on ERIE Pumps for the profitable production of sand and gravel. Start your next dredging job with the advantages that go with ERIE Pumps.

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Rex 27-E Mechanical Man, 6 cyl. power

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Rex, Jaeger and LaBour 2" self-priming
LaBour 3" electric, self-priming
Marlo 6" electric or gas, self-priming
3" & 4" open and closed diaphragm
Rex and Humdinger—plunger
6" electric sump
Goulds 2" triplex road
C. H. & E. triplex road (80 G.P.M.)

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Rock drills, paving breakers, riveting hammers, etc.

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2—6 ton, 3 wheel Huber and Galion—gasoline
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3—12 ton, 3 wheel Austin and Buffalo—steam
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Allis-Chalmers "35"
Caterpillar "30" & "60"
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Sold with or without bulldozers.
Several McCormick-Deering and Fordson rubber tired wheel tractors

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2—I-R FM2 like new
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3—Mack 4AK trks. with dble. Heil hsts.—pneu. tires
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1—4 yd. Hayward Class "G" clamshell.
34—Williams, Blaw Knox, Owen clamshell buckets, all sizes & types.
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Large lot including std. ga. 6 and 12 yd. and 20 yd., 36 in. ga. 5 yd. and 24 ga. 1½ yd.

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1—Central mixing plant consisting of 40-S 1½ yd. Smith tilting mixer, 225-ton Blaw Knox 3-compartment steel bin with 3-beam scale; etc.

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1—Link Belt K-55, ser. No. 1654, crawler mounted gas crane, 70' boom and 2 yd. bucket.
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1—Allis Chalmers size No. 6, style N; openings 12x44 in.
2—McCully No. 3 gyratory crushers.
1—Climax No. 2½ jaw crusher, 10x20 in. No. 2637.
1—Telsmith No. 9A jaw crusher, Ser. No. 4139, 9x16 in.
1—Allis Chalmers smooth type crushing rolls, size 42x16 in.

DRILLS
6—Wagon drills, Ingersoll Rand & Gardner Denver with IRX71 and GD17 & 21 drills.

DERRICKS
5—All steel stiff leg derricks: 1—25 ton Clyde, 50' boom; 1—15 ton Dobbie, 80' boom; 1—15 ton Clyde, 50' boom; 1—15 ton Clyde "A" frame barge derrick, 50' boom; 1—10 ton Insley, 80' boom.
4—Steel guy derricks, 6 ton cap., Bedford, 80' boom, 90' mast.

LOADERS
1—Barber Greene model 42-A.
1—Haiss model A.

LOCOMOTIVES
6—Elec. storage battery type, 4 ton, 24" ga. with battery boxes: 4—Whitcomb; 2—Atlas.
22—Gas locomotives: 6—8 ton Vulcan std. ga.; 2—7 & 8 ton Whitcomb, 36" ga.; 3—4 ton Vulcan & Davenport, gear drive, 36" ga.; 1—4 ton Plymouth friction drive, 36" ga.; 7—7 ton Whitcomb & Plymouth, gear drive, 24" ga.; 3—Plymouth 4 ton, 24" ga.

PUMPS
4—10" Allis Chalmers centrifugal pumps, direct connected to 200 HP., 440 V., A.C., motors; cap. 3500 GPM, 175' head.
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701-745 KENTUCKY AVENUE .. .. INDIANAPOLIS, IND.

See Gentlemen — ALL OUR MACHINES ARE EQUIPPED WITH TRU•LAY *Preformed*

"None but the finest of materials enters into the manufacture of our machines. . . . For two reasons: first—because they give you a better, more satisfactory machine. Second—they help us sell by offering sales points in themselves.

"Now this TRU-LAY Preformed wire rope—it really is a talking point. In the first place, it lasts unusually long—gives excellent service. It resists kinking and whipping; spools on the drum perfectly. Crown wires that have worn to the breaking point lie flat and in place—refusing to stick out to jab workmen's hands. It is a safe rope. Your men can socket it easily, rapidly, and more dependably. Yes sir . . ."

NOTE: *The rapid increase in the number of manufacturers who are specifying Tru-Lay Preformed as standard equipment is just another proof of its all-around superiority.*

AMERICAN CABLE DIVISION
AMERICAN CHAIN & CABLE COMPANY, Inc.
WILKES-BARRE, PENNSYLVANIA

District Offices: Atlanta, Chicago, Detroit, Denver, Los Angeles, New York, Philadelphia, Pittsburgh, Houston, San Francisco

GREEN SIGNIFIES SAFETY

In Business for Your Safety

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A FEW OF THE 137 AMERICAN CHAIN & CABLE INDUSTRIAL PRODUCTS

AMERICAN CHAIN DIVISION
(DOMINION CHAIN COMPANY, Ltd., in Canada)
Weed Tire Chains • Welded and Weldless Chain • Malleable Castings • Railroad Specialties

AMERICAN CABLE DIVISION
Tru-Lay Preformed Wire Rope • Tru-Loc Processed Fittings • Crescent Brand Wire Rope Tru-Stop Brakes

ANDREW C. CAMPBELL DIVISION
Abrasive Cutting Machines • Floformers Special Machinery • Nibbling Machines

FORD CHAIN BLOCK DIVISION
Chain Hoists • Trolleys

HIGHLAND IRON & STEEL DIVISION
Wrought Iron Bars and Shapes

MANLEY MANUFACTURING DIVISION
Automotive Service Station Equipment

OWEN SILENT SPRING COMPANY, Inc.
Owen Cushion and Mattress Spring Centers

PAGE STEEL AND WIRE DIVISION
Page Fence • Wire and Rod Products Traffic Tape • Welding Wire

READING-PRATT & CADY DIVISION
Valves • Electric Steel Fittings

READING STEEL CASTING DIVISION
Electric Steel Castings, Rough or Machined

WRIGHT MANUFACTURING DIVISION
Chain Hoists • Electric Hoists and Cranes

TRU•LAY *Preformed* WIRE ROPE

ALL AMERICAN CABLE DIVISION ROPES MADE OF IMPROVED PLOW STEEL ARE IDENTIFIED BY THE EMERALD STRAND

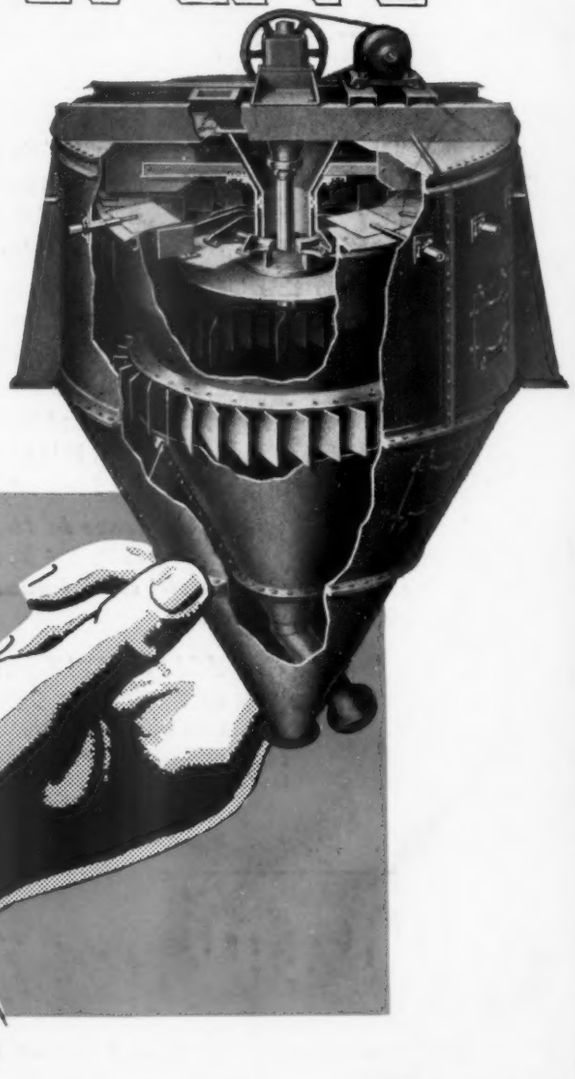
Let's look at the record

1. To date, 213 Sturtevants sold in the cement field alone . . . and many more in other industries.
2. Producers of high early strength cement adopt Sturtevants for economic reasons in meeting stringent specifications demanded today.
3. Operators . . . who will not gamble with the quality of their products . . . rely upon Sturtevant equipment and Sturtevant experience to solve their separating problems.

STURTEVANT

All installations are engineered . . . that is, accurately fitted to the job, so that Surtevant performance is known and guaranteed beforehand.

As a result, all important factors in separation are fully realized by the fortunate owner of a Sturtevant Air Separator: Particle size control, specific surface area, minimum temperatures, increased mill capacities as much as 25% to 100%, uniformity in the finished product, whether 60-mesh fineness or micron sizes.



If you have a difficult problem of sizing . . . from coarse to superfine materials . . . See STURTEVANT. Send for Bulletin and read up on modern methods of separation.

STURTEVANT MILL CO.

Harrison Square, Boston, Mass.